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Test Report

EUT Name: HSA-15

Model No.: HSA-15

CFR Part 22H, 24E, 27C

Prepared for:

Harman International Industries Incorporated
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Mountain View CA 94043
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Statement of Compliance

Manufacturer:	Harman International Industries Incorporated 636 Ellis St Mountain View CA 94043
Name of Equipment:	HSA-15
Model No.	HSA-15
Type of Equipment:	Intentional Radiator
Test Dates:	March 15, 2018 to April 15, 2018

Test Specifications:

CFR 47 Part 22, 24, 27

Test Methods:

FCC KDB 971168, v03r01
ANSI C63.26-2015

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Isaac Aguilar	May 29, 2018	Arndt Stocker	May 29, 2018
Test Engineer	Date	Operations Manager	Date

Testing Cert #3331.02 **US1131**

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1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC based on the results of testing performed on March 15, 2018 through April 15, 2018 on the HSA-15 manufactured by Harman International Industries Incorporated. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	FCC Rule	Test Method	Result[1]
Conducted RF Output Power	§2.1046	KDB 971168, section 5 ANSI C63.26, section 5.2	**Complied**
Equivalent (Isotropic) Radiated Power	§22.913 §24.232 §27.50	KDB 971168, section 5 ANSI C63.26, section 5.2	**Complied**
Peak-to-average ratio	§24.232 §27.50	KDB 971168, section 5.7 ANSI C63.26, section 5.2	**Complied**
Occupied Bandwidth	§2.1049	KDB 971168, section 4 ANSI C63.26, section 5.4	**Complied**
Spurious Emissions at antenna terminals	§2.1051 §22.917 §24.238 §27.53	KDB 971168, section 6 ANSI C63.26, section 5.7	**Complied**
Band Edge	§2.1051 §22.917 §24.238 §27.53	KDB 971168, section 6 ANSI C63.26, section 5.7	**Complied**
Transmitter Unwanted Emissions	§2.1053 §22.917 §24.238 §27.53	KDB 971168, section 7 TIA 603-D, section 2.2.12 ANSI C63.26, section 5.5	**Complied**
Frequency Stability	§2.1055 §22.355 §24.235 §27.54	KDB 971168, section 9 ANSI C63.26, section 5.6	**Complied**

Notes:
1. N/A.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at 1279 Quarry Lane, Ste. A., Pleasanton, CA 94566, is accredited by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US1131). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / A2LA

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab Code US5254). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

TUV Rheinland of North America at the 1279 Quarry Ln, Pleasanton, CA 94566 address is accredited by Industry Canada for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by Industry Canada (File Number 2932M). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). The accreditation is updated every 3 years.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0031
VCCI Registration No. for Santa Clara: A-0032

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln,

Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Pleasanton, California 94566, USA. The 5015 Brandin Ct. Fremont CA 94538, USA location is considered a Pleasanton annex.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code **Error! Reference source not found.**). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TÜV Rheinland of North America.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurement. The fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBµV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBµV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable Loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainties

Table 2: Summary of Uncertainties

Measurement Uncertainty	U_{lab}	U_{cispr}
Radiated Disturbance		
30 MHz – 25,000 MHz	3.2 dB	5.2 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.4 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.5 dB

Note: U_{lab} is the calculated Combined Standard Uncertainty
U_{cispr} is the measurement uncertainty requirement per CISPR 16.

Measurement Uncertainty – Radio Testing

The estimated combined standard uncertainty for frequency error measurements is ± 3.88 Hz
The estimated combined standard uncertainty for carrier power measurements is ± 1.59 dB.
The estimated combined standard uncertainty for adjacent channel power measurements is ± 1.47 dB.
The estimated combined standard uncertainty for modulation frequency response measurements is ± 0.46 dB.
The estimated combined standard uncertainty for transmitter conducted emission measurements is ± 4.01 dB

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 17025:2005.

3 Product Information

3.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

3.2 Customer

Table 3: Customer Information

Company Name	Harman International Industries Incorporated
Address	636 Ellis St
City, State, Zip	Mountain View CA 94043
Country	US
Phone	+1 (408) 318-8245

3.3 Product Description

The Harman OBD II, is a car OBD sensor for use in a motor vehicle. The device has the capability of operating in the following frequency bands: LTE 2, LTE 4, LTE 5, LTE 12, WCDMA 2, WCDMA 5 and WiFi 2.4 GHz supporting 20 MHz bandwidth modulation only.

3.4 Equipment Under Test (EUT)

Table 4: EUT Specifications

EUT Specification	
Power Input	12V DC
Number of Antenna Feeds:	3 Antenna Feeds
Hardware Version	V1.0
RF Software Version	N/A
Cellular Transmit Frequency Band	LTE Band 2/4/5/12 WCDMA Band 2/5
Cellular Max. Rated Power Output	23 dBm
Cellular Antenna Type	FPC/1 dBi
Cellular Modulation Type	QPSK/16-QAM
Type of Equipment	☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other: OBD II Sensor for Motor Vehicles

Table 5: Description of Sample used for Testing

Device	Serial Number	Configuration	Used For
Harman OBD II	bd41b8da	Conducted/Radiated	Conducted Cellular test
Harman OBD II	bd41b8ac	Conducted/Radiated	Radiated Tests
Harman OBD II	bd41b8d3	Conducted	WiFi Testing

3.5 Test Equipment Configuration

The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to the declared rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of a EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing.

3.6 Operating Mode

In the case of a EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing.

4 Test Data

Testing was performed in accordance with FCC rules. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in ANSI C63.26-2015 and FCC KDB 971168 D01 V03 were used. Worst case configuration was determined to be QPSK and was the modulation chosen for testing throughout this report.

4.1 Occupied Bandwidth

§2.1049: The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

§22.917(b)(1)… The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§24.238(b)… The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

4.1.1 Test Methodology

4.1.1.1 26dB Bandwidth

KDB 971168 D01 V03 section 4.2 and ANSI C63.26-2015 Section 5.43 Occupied bandwidth – Relative Measurement procedure were used. The EUT was setup with the CMW500 to transmit at 100% duty cycle and the corresponding bandwidths, modulations, and Recourse Block configurations. In all cases the EUT was setup to transmit at maximum power via the CMW500. The device's antenna port was directly connected to the spectrum analyzer with the following setting:

1. Center frequency set to the EUT's channel center frequency
2. Span = 1.5 to 2 times the anticipated OBW
3. RBW = 1% to 5% of the anticipated OBW
4. VBW ≥ 3 x RBW
5. Reference level set not to exceed analyzer's input mixer level for linear operation
6. Detector = Peak
7. Trace = Max Hold

Measured the maximum power of the signal (reference value). Used reference value to find 26 dBc above and below the reference value. Used the delta marker function to determine the 26 OBW.

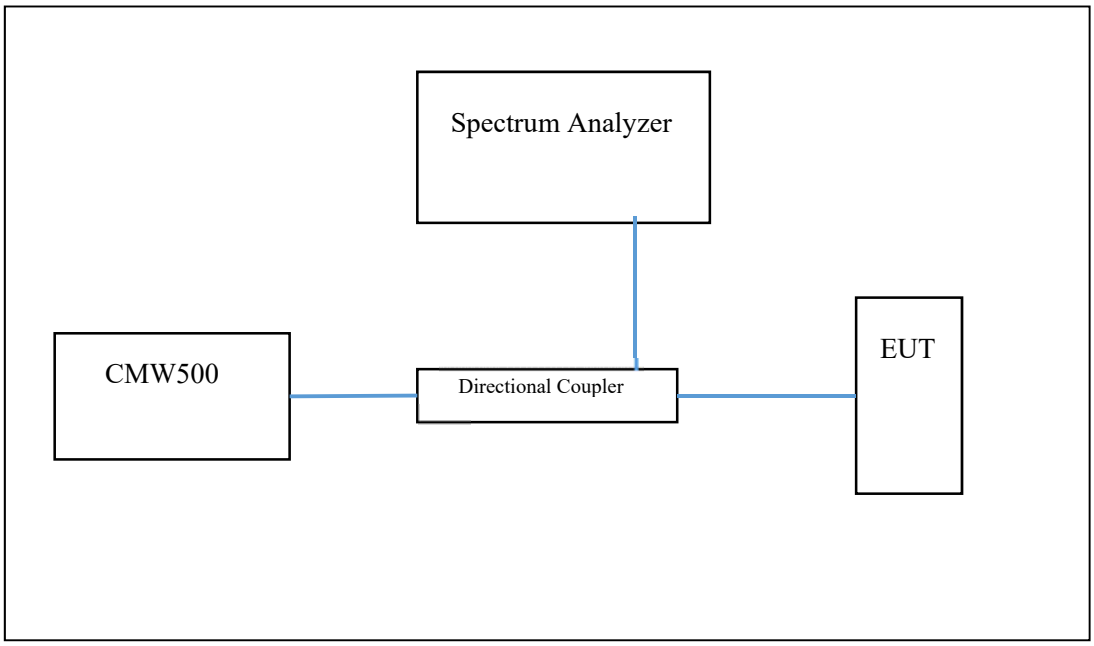
4.1.1.2 99% Bandwidth

KDB 971168 D01 V03 section 4.3 and ANSI C63.26-2015 Section 5.4.4 Occupied Bandwidth – Power Bandwidth (99%) measurement procedure was used. The EUT was setup with the CMW500 to transmit at 100% duty cycle and the corresponding bandwidths, modulations, and Recourse Block configurations. In all cases the EUT was setup to transmit at maximum power via the CMW500. The device antenna port was directly connected to the spectrum analyzer with the following settings:

1. Center frequency set to the EUT channel center frequency
2. Span = 1.5 x OBW
3. RBW = 1% to 5% of the anticipated OBW
4. Reference level set not to exceed the analyzer's input mixer level for linear operation
5. Detector = Peak
6. Trace = Max Hold

Measured the device's OBW using the analyzer's 99% OBW function.

4.1.2 Test Setup



4.1.3 Deviations

N/A

4.1.4 Test Results

4.1.4.1 Part 22

4.1.4.1.1 WCDMA Band 5 – QPSK

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Limit (MHz)
4132	826.4	4.74	N/A
4183	836.6	4.72	N/A
4233	846.6	4.72	N/A

4.1.4.1.2 LTE Band 5 – QPSK

Bandwidth Setting (MHZ)	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Limit (MHz)
1.4	20407	824.7	1.37	N/A
	20525	836.5	1.37	
	20643	848.3	1.36	
3	20415	825.5	2.98	
	20525	836.5	3.00	
	20635	847.5	3.00	
5	20425	826.5	4.89	
	20525	836.5	4.90	
	20625	846.5	4.88	
10	20450	829	9.47	
	20525	836.5	9.45	
	20600	844	9.45	

4.1.4.2 Part 24

4.1.4.2.1 WCDMA Band 2 – QPSK

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Limit (MHz)
9262	1852.4	4.76	N/A
9400	1880	4.75	N/A
9538	1907.6	4.75	N/A

4.1.4.2.2 LTE Band 2 – QPSK

Bandwidth Setting (MHZ)	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Limit (MHz)
1.4	18607	1850.7	1.38	N/A
	18900	1880	1.37	
	19193	1909.3	1.38	
3	18615	1851.5	2.99	
	18900	1880	3.00	
	19185	1908.5	3.00	
5	18625	1852.5	4.89	
	18900	1880	4.87	
	19175	1907.5	4.86	
10	18650	1855	9.47	
	18900	1880	9.47	
	19150	1905	9.47	
15	18675	1857.5	14.23	
	18900	1880	14.01	
	19125	1902.5	14.07	
20	18700	1860	18.51	
	18900	1880	18.51	
	19100	1900	18.63	

4.1.4.3 Part 27

4.1.4.3.1 LTE Band 4 – QPSK

Bandwidth Setting (MHZ)	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	Limit (MHz)
1.4	19957	1710.7	1.39	N/A
	20175	1732.5	1.38	
	20393	1754.3	1.37	
3	19965	1711.5	2.99	
	20175	1732.5	3.00	
	20385	1753.5	3.00	
5	19975	1712.5	4.90	
	20175	1732.5	4.88	
	20375	1752.5	4.89	
10	20000	1715	9.50	
	20175	1732.5	9.45	
	20350	1750	9.50	
15	20025	1717.5	14.16	
	20175	1732.5	14.04	
	20325	1747.5	14.14	
20	20050	1720	18.51	
	20175	1732.5	18.59	
	20300	1745	18.59	

4.1.4.3.2 LTE Band 12 – QPSK

Bandwidth Setting (MHZ)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
1.4	23017	699.7	1.18	N/A
	23095	707.5	1.17	
	23173	715.3	1.17	
3	23025	700.5	2.75	
	23095	707.5	2.74	
	23165	714.5	2.74	
5	23035	701.5	4.52	
	23095	707.5	4.52	
	23155	713.5	4.51	
10	23060	704	8.92	
	23095	707.5	8.92	
	23130	711	8.97	

4.2 Conducted RF Output Power/ERP/ERIP

§2.1046(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§22.913(a)(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

§24.232(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

§27.50(c)(10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

§27.50(d)(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

4.2.1 Test Methodology

4.2.1.1 Spectrum Analyzer Method

KDB 971168 D01 V03 section 5 and ANSI C63.26-2015 Section 5.2.4.4 General procedure for measuring average power of a broadband signal with a spectrum analyzer or EMI receiver measurement procedure was used. The EUT was configured with the CMW 500 to the measured center frequency transmitting at a 100% duty cycle with the correct bandwidth, modulation, and Resource Block configuration in the case of LTE. In all cases the EUT was set to transmit at maximum power by the CMW500. The EUT was directly connected to the spectrum analyzer with the following settings:

1. Center frequency set to the EUT's channel center frequency
2. Span = 2-3 x the OBW
3. RBW = 1% to 5% OBW
4. VBW ≥ 3 x RBW
5. Sweep Points ≥ 2 x Span/RBW
6. Sweep time: Auto-couple
7. Detector = power averaging (rms)

The power measurement is made by averaging 100 or more traces. The final conducted power is calculated by integrating over the spectrum using the instruments channel power measurement function. The EIRP values are calculated using equation from section 5.6 of KDB 971168 D01 V03.

$$EIRP = P_{measured} + G_T - L_c$$

ERP values are calculated using the EIRP by the following:

$$ERP = EIRP - 2.15\ dB$$

Where:

$P_{measured}$ ≡ maximum conducted power

G_T ≡ gain of transmitting antenna in dBi

L_c ≡ signal attenuation between transmitter and antenna in EUT

4.2.1.2 Average Power Meter Method

KDB 971168 D01 section 5 and ANSI C63.26-2015 Section 5.2.4.2 – General procedure for measuring average power with an average power meter was used. The EUT was setup to transmit at 100% duty cycle and the center frequency, output power and resource block configuration (LTE) were all set using a CMW 500 call box. The EUT was directly connected to the power sensor. The power sensors VBW is greater than the OBW of the transmitting signal and the sensors rise time is faster than the rise time of the RF signal to ensure measurement integrity.

The EIRP values are calculated using equation from section 5.6 of KDB 971168 D01 V03.

$$EIRP = P_{measured} + G_T - L_c$$

ERP values are calculated using the EIRP by the following:

$$ERP = EIRP - 2.15\ dB$$

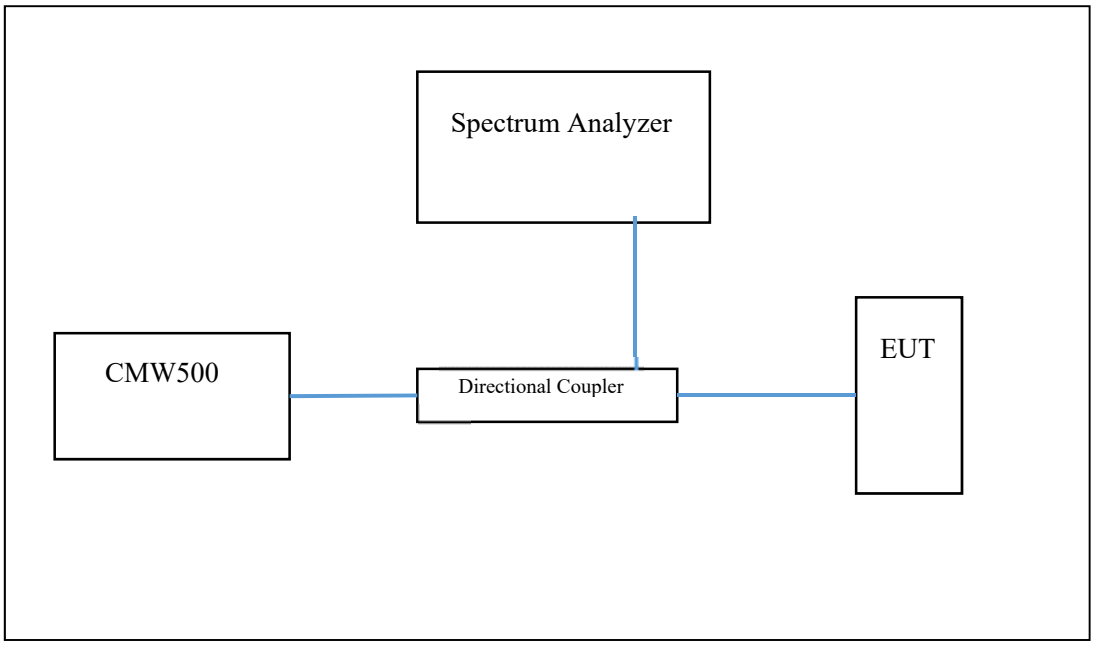
Where:

$P_{measured}$ ≡ maximum conducted power

G_T ≡ gain of transmitting antenna in dBi

L_c ≡ signal attenuation between transmitter and antenna in EUT

4.2.2 Test Setup



4.2.3 Deviations

N/A

4.2.4 Test Results

4.2.4.1 Part 22

4.2.4.1.1 WCDMA Band 5

Channel Number	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)	E.R.P (dbm)	Limit E.R.P (dBm)	Margin (dB)
4132	826.4	23.36	0.5	23.86	21.71	38.45	16.74
4183	836.6	23.45	0.5	23.95	21.8	38.45	16.65
4233	846.6	23.37	0.5	23.87	21.72	38.45	16.73

4.2.4.1.2 LTE Band 5-QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
1.4	20407	824.7	1	0	22.38	1	23.38	21.23	38.45	17.22
				3	22.43	1	23.43	21.28	38.45	17.17
				5	22.29	1	23.29	21.14	38.45	17.31
			3	0	22.36	1	23.36	21.21	38.45	17.24
				3	22.35	1	23.35	21.2	38.45	17.25
			6	0	21.34	1	22.34	20.19	38.45	18.26
	20525	836.5	1	0	22.44	1	23.44	21.29	38.45	17.16
				3	22.83	1	23.83	21.68	38.45	16.77
				5	22.36	1	23.36	21.21	38.45	17.24
			3	0	22.3	1	23.3	21.15	38.45	17.3
				3	22.4	1	23.4	21.25	38.45	17.2
			6	0	21.29	1	22.29	20.14	38.45	18.31
	20643	836.5	1	0	22.56	1	23.56	21.41	38.45	17.04
				3	22.49	1	23.49	21.34	38.45	17.11
				5	22.6	1	23.6	21.45	38.45	17
			3	0	22.4	1	23.4	21.25	38.45	17.2
				3	22.29	1	23.29	21.14	38.45	17.31
			6	0	21.35	1	22.35	20.2	38.45	18.25

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
3	20415	825.5	1	0	22.38	1	23.38	21.23	38.45	17.22
				8	22.28	1	23.28	21.13	38.45	17.32
				14	22.29	1	23.29	21.14	38.45	17.31
			8	0	21.39	1	22.39	20.24	38.45	18.21
				7	21.28	1	22.28	20.13	38.45	18.32
			15	0	21.34	1	22.34	20.19	38.45	18.26
	20525	836.5	1	0	22.49	1	23.49	21.34	38.45	17.11
				8	22.25	1	23.25	21.1	38.45	17.35
				14	22.33	1	23.33	21.18	38.45	17.27
			8	0	21.33	1	22.33	20.18	38.45	18.27
				7	21.38	1	22.38	20.23	38.45	18.22
			15	0	21.27	1	22.27	20.12	38.45	18.33
	20635	847.5	1	0	22.32	1	23.32	21.17	38.45	17.28
				8	22.4	1	23.4	21.25	38.45	17.2
				14	22.49	1	23.49	21.34	38.45	17.11
			8	0	21.31	1	22.31	20.16	38.45	18.29
				7	21.22	1	22.22	20.07	38.45	18.38
			15	0	21.36	1	22.36	20.21	38.45	18.24

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
5	20425	826.5	1	0	22.09	1	23.09	20.94	38.45	17.51
				13	21.88	1	22.88	20.73	38.45	17.72
				24	22.14	1	23.14	20.99	38.45	17.46
			12	0	21.37	1	22.37	20.22	38.45	18.23
				13	21.25	1	22.25	20.1	38.45	18.35
			25	0	21.36	1	22.36	20.21	38.45	18.24
	20525	836.5	1	0	22.54	1	23.54	21.39	38.45	17.06
				13	22.25	1	23.25	21.1	38.45	17.35
				24	22.39	1	23.39	21.24	38.45	17.21
			12	0	21.41	1	22.41	20.26	38.45	18.19
				13	21.36	1	22.36	20.21	38.45	18.24
			25	0	21.29	1	22.29	20.14	38.45	18.31
	20625	846.5	1	0	22.18	1	23.18	21.03	38.45	17.42
				13	22.14	1	23.14	20.99	38.45	17.46
				24	22.32	1	23.32	21.17	38.45	17.28
			12	0	21.24	1	22.24	20.09	38.45	18.36
				13	21.3	1	22.3	20.15	38.45	18.3
			25	0	21.27	1	22.27	20.12	38.45	18.33

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
10	20450	829	1	0	22.35	1	23.35	21.2	38.45	17.25
				25	22.45	1	23.45	21.3	38.45	17.15
				49	22.35	1	23.35	21.2	38.45	17.25
			25	0	21.37	1	22.37	20.22	38.45	18.23
				25	21.31	1	22.31	20.16	38.45	18.29
			50	0	21.31	1	22.31	20.16	38.45	18.29
	20525	836.6	1	0	22.51	1	23.51	21.36	38.45	17.09
				25	22.63	1	23.63	21.48	38.45	16.97
				50	22.42	1	23.42	21.27	38.45	17.18
			25	0	21.35	1	22.35	20.2	38.45	18.25
				25	21.31	1	22.31	20.16	38.45	18.29
			50	0	21.34	1	22.34	20.19	38.45	18.26
	20600	844	1	0	22.43	1	23.43	21.28	38.45	17.17
				25	22.19	1	23.19	21.04	38.45	17.41
				50	22.34	1	23.34	21.19	38.45	17.26
			25	0	21.43	1	22.43	20.28	38.45	18.17
				25	21.3	1	22.3	20.15	38.45	18.3
			50	0	21.3	1	22.3	20.15	38.45	18.3

4.2.4.2 Part 24

4.2.4.2.1 WCDMA Band 2

Channel Number	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)	E.R.P (dm)	Limit E.I.R.P (dBm)	Margin (dB)
9262	1852.4	23.20	0.5	23.7	21.55	33	9.30
9400	1880	23.11	0.5	23.61	21.46	33	9.39
9538	1907.6	23.11	0.5	23.61	21.46	33	9.39

4.2.4.2.2 LTE Band 2 – QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
1.4	18607	1850.7	1	0	22.16	1	23.16	21.01	33	10.84
				3	22.18	1	23.18	21.03	33	10.82
				5	22.06	1	23.06	20.91	33	10.94
			3	0	22.27	1	23.27	21.12	33	10.73
				3	22.3	1	23.3	21.15	33	10.7
			6	0	21	1	22	19.85	33	12
	18900	1880	1	0	22.41	1	23.41	21.26	33	10.59
				3	22.4	1	23.4	21.25	33	10.6
				5	22.33	1	23.33	21.18	33	10.67
			3	0	22.24	1	23.24	21.09	33	10.76
				3	22.14	1	23.14	20.99	33	10.86
			6	0	21.23	1	22.23	20.08	33	11.77
	19193	1909.3	1	0	21.89	1	22.89	20.74	33	11.11
				3	21.93	1	22.93	20.78	33	11.07
				5	21.86	1	22.86	20.71	33	11.14
			3	0	22.01	1	23.01	20.86	33	10.99
				3	21.99	1	22.99	20.84	33	11.01
			6	0	21.09	1	22.09	19.94	33	11.91

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
3	18615	1851.5	1	0	22.14	1	23.14	20.99	33	10.86
				8	22.15	1	23.15	21	33	10.85
				14	22.18	1	23.18	21.03	33	10.82
			8	0	21.11	1	22.11	19.96	33	11.89
				7	21.09	1	22.09	19.94	33	11.91
			15	0	21.1	1	22.1	19.95	33	11.9
	18900	1880	1	0	22.33	1	23.33	21.18	33	10.67
				8	22.21	1	23.21	21.06	33	10.79
				14	22.21	1	23.21	21.06	33	10.79
			8	0	21.15	1	22.15	20	33	11.85
				7	21.1	1	22.1	19.95	33	11.9
			15	0	21.13	1	22.13	19.98	33	11.87
	19185	1908.5	1	0	22.15	1	23.15	21	33	10.85
				8	22.12	1	23.12	20.97	33	10.88
				14	22.23	1	23.23	21.08	33	10.77
			8	0	20.97	1	21.97	19.82	33	12.03
				7	20.96	1	21.96	19.81	33	12.04
			15	0	21.07	1	22.07	19.92	33	11.93

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
5	18625	1852.5	1	0	22	1	23	20.85	33	11
				13	22.06	1	23.06	20.91	33	10.94
				24	22.29	1	23.29	21.14	33	10.71
			12	0	21.11	1	22.11	19.96	33	11.89
				13	21.17	1	22.17	20.02	33	11.83
			25	0	21.1	1	22.1	19.95	33	11.9
	18900	1880	1	0	22.49	1	23.49	21.34	33	10.51
				13	22.2	1	23.2	21.05	33	10.8
				24	22.41	1	23.41	21.26	33	10.59
			12	0	21.24	1	22.24	20.09	33	11.76
				13	21.1	1	22.1	19.95	33	11.9
			25	0	21.13	1	22.13	19.98	33	11.87
	19175	1907.5	1	0	22.03	1	23.03	20.88	33	10.97
				13	21.92	1	22.92	20.77	33	11.08
				24	22.09	1	23.09	20.94	33	10.91
			12	0	21.21	1	22.21	20.06	33	11.79
				13	21.1	1	22.1	19.95	33	11.9
			25	0	21.2	1	22.2	20.05	33	11.8

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
10	18650	1855	1	0	22.33	1	23.33	21.18	33	10.67
				25	22.19	1	23.19	21.04	33	10.81
				49	22.25	1	23.25	21.1	33	10.75
			25	0	21.16	1	22.16	20.01	33	11.84
				25	21.22	1	22.22	20.07	33	11.78
			50	0	21.22	1	22.22	20.07	33	11.78
	18900	1880	1	0	22.42	1	23.42	21.27	33	10.58
				25	22.42	1	23.42	21.27	33	10.58
				50	22.36	1	23.36	21.21	33	10.64
			25	0	21.3	1	22.3	20.15	33	11.7
				25	21.22	1	22.22	20.07	33	11.78
			50	0	21.26	1	22.26	20.11	33	11.74
	19150	1905	1	0	22.46	1	23.46	21.31	33	10.54
				25	22.28	1	23.28	21.13	33	10.72
				50	22.2	1	23.2	21.05	33	10.8
			25	0	21.19	1	22.19	20.04	33	11.81
				25	21.21	1	22.21	20.06	33	11.79
			50	0	21.18	1	22.18	20.03	33	11.82

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
15	18675	1857.5	1	0	22.34	1	23.34	21.19	33	10.66
				38	22	1	23	20.85	33	11
				74	22.24	1	23.24	21.09	33	10.76
			36	0	21.27	1	22.27	20.12	33	11.73
				39	21.09	1	22.09	19.94	33	11.91
			75	0	21.13	1	22.13	19.98	33	11.87
	18900	1880	1	0	22.39	1	23.39	21.24	33	10.61
				38	22.13	1	23.13	20.98	33	10.87
				74	22.3	1	23.3	21.15	33	10.7
			36	0	21.23	1	22.23	20.08	33	11.77
				39	21.11	1	22.11	19.96	33	11.89
			75	0	21.19	1	22.19	20.04	33	11.81
	19125	1902.5	1	0	22.35	1	23.35	21.2	33	10.65
				38	21.96	1	22.96	20.81	33	11.04
				74	22.28	1	23.28	21.13	33	10.72
			36	0	21.2	1	22.2	20.05	33	11.8
				39	21.2	1	22.2	20.05	33	11.8
			75	0	21.12	1	22.12	19.97	33	11.88

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
20	18700	1860	1	0	22.37	1	23.37	21.22	33	10.63
				50	22.24	1	23.24	21.09	33	10.76
				99	22.79	1	23.79	21.64	33	10.21
			50	0	21.2	1	22.2	20.05	33	11.8
				99	21.17	1	22.17	20.02	33	11.83
			100	0	21.15	1	22.15	20	33	11.85
	18900	1880	1	0	22.57	1	23.57	21.42	33	10.43
				50	22.47	1	23.47	21.32	33	10.53
				99	22.29	1	23.29	21.14	33	10.71
			50	0	21.38	1	22.38	20.23	33	11.62
				99	21.2	1	22.2	20.05	33	11.8
			100	0	21.33	1	22.33	20.18	33	11.67
	19100	1900	1	0	22.42	1	23.42	21.27	33	10.58
				50	22.16	1	23.16	21.01	33	10.84
				99	22.04	1	23.04	20.89	33	10.96
			50	0	21.26	1	22.26	20.11	33	11.74
				99	21.25	1	22.25	20.1	33	11.75
			100	0	21.12	1	22.12	19.97	33	11.88

4.2.4.3 Part 27

4.2.4.3.1 LTE Band 4 – QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
1.4	19957	1710.7	1	0	21.37	1	22.37	20.22	30	8.63
				3	21.47	1	22.47	20.32	30	8.53
				5	21.41	1	22.41	20.26	30	8.59
			3	0	21.49	1	22.49	20.34	30	8.51
				3	21.42	1	22.42	20.27	30	8.58
			6	0	20.37	1	21.37	19.22	30	9.63
	20175	1732.5	1	0	21.63	1	22.63	20.48	30	8.37
				3	21.61	1	22.61	20.46	30	8.39
				5	21.45	1	22.45	20.3	30	8.55
			3	0	21.52	1	22.52	20.37	30	8.48
				3	21.39	1	22.39	20.24	30	8.61
			6	0	20.51	1	21.51	19.36	30	9.49
	20393	1754.3	1	0	21.53	1	22.53	20.38	30	8.47
				3	21.87	1	22.87	20.72	30	8.13
				5	21.56	1	22.56	20.41	30	8.44
			3	0	21.64	1	22.64	20.49	30	8.36
				3	21.62	1	22.62	20.47	30	8.38
			6	0	20.54	1	21.54	19.39	30	9.46

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
3	19965	1711.5	1	0	21.56	1	22.56	20.41	30	8.44
				8	21.53	1	22.53	20.38	30	8.47
				14	21.77	1	22.77	20.62	30	8.23
			8	0	20.52	1	21.52	19.37	30	9.48
				7	20.55	1	21.55	19.4	30	9.45
			15	0	20.45	1	21.45	19.3	30	9.55
	20175	1732.5	1	0	21.67	1	22.67	20.52	30	8.33
				8	21.51	1	22.51	20.36	30	8.49
				14	21.59	1	22.59	20.44	30	8.41
			8	0	20.58	1	21.58	19.43	30	9.42
				7	20.49	1	21.49	19.34	30	9.51
			15	0	20.49	1	21.49	19.34	30	9.51
	20385	1753.5	1	0	21.6	1	22.6	20.45	30	8.4
				8	21.49	1	22.49	20.34	30	8.51
				14	21.59	1	22.59	20.44	30	8.41
			8	0	20.52	1	21.52	19.37	30	9.48
				7	20.47	1	21.47	19.32	30	9.53
			15	0	20.49	1	21.49	19.34	30	9.51

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
5	19975	1712.5	1	0	21.27	1	22.27	20.12	30	8.73
				13	21.57	1	22.57	20.42	30	8.43
				24	21.68	1	22.68	20.53	30	8.32
			12	0	20.6	1	21.6	19.45	30	9.4
				13	20.62	1	21.62	19.47	30	9.38
			25	0	20.58	1	21.58	19.43	30	9.42
	20175	1732.5	1	0	21.88	1	22.88	20.73	30	8.12
				13	21.46	1	22.46	20.31	30	8.54
				24	21.64	1	22.64	20.49	30	8.36
			12	0	20.59	1	21.59	19.44	30	9.41
				13	20.47	1	21.47	19.32	30	9.53
			25	0	20.57	1	21.57	19.42	30	9.43
	20375	1752.5	1	0	21.41	1	22.41	20.26	30	8.59
				13	21.53	1	22.53	20.38	30	8.47
				24	21.4	1	22.4	20.25	30	8.6
			12	0	20.59	1	21.59	19.44	30	9.41
				13	20.53	1	21.53	19.38	30	9.47
			25	0	20.53	1	21.53	19.38	30	9.47

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
10	20000	1715	1	0	21.68	1	22.68	20.53	30	8.32
				25	21.55	1	22.55	20.4	30	8.45
				49	21.5	1	22.5	20.35	30	8.5
			25	0	20.68	1	21.68	19.53	30	9.32
				25	20.39	1	21.39	19.24	30	9.61
			50	0	20.54	1	21.54	19.39	30	9.46
	20175	1732.5	1	0	21.65	1	22.65	20.5	30	8.35
				25	21.49	1	22.49	20.34	30	8.51
				50	21.57	1	22.57	20.42	30	8.43
			25	0	20.59	1	21.59	19.44	30	9.41
				25	20.45	1	21.45	19.3	30	9.55
			50	0	20.57	1	21.57	19.42	30	9.43
	20350	1750	1	0	21.74	1	22.74	20.59	30	8.26
				25	21.6	1	22.6	20.45	30	8.4
				50	21.55	1	22.55	20.4	30	8.45
			25	0	20.56	1	21.56	19.41	30	9.44
				25	20.47	1	21.47	19.32	30	9.53
			50	0	20.53	1	21.53	19.38	30	9.47

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
15	20025	1717.5	1	0	20.73	1	21.73	19.58	30	9.27
				38	21.41	1	22.41	20.26	30	8.59
				74	21.54	1	22.54	20.39	30	8.46
			36	0	20.53	1	21.53	19.38	30	9.47
				39	20.61	1	21.61	19.46	30	9.39
			75	0	20.58	1	21.58	19.43	30	9.42
	20175	1732.5	1	0	21.69	1	22.69	20.54	30	8.31
				38	21.42	1	22.42	20.27	30	8.58
				74	21.58	1	22.58	20.43	30	8.42
			36	0	20.66	1	21.66	19.51	30	9.34
				39	20.42	1	21.42	19.27	30	9.58
			75	0	20.54	1	21.54	19.39	30	9.46
	20325	1747.5	1	0	21.68	1	22.68	20.53	30	8.32
				38	21.38	1	22.38	20.23	30	8.62
				74	21.72	1	22.72	20.57	30	8.28
			36	0	20.62	1	21.62	19.47	30	9.38
				39	20.57	1	21.57	19.42	30	9.43
			75	0	20.57	1	21.57	19.42	30	9.43

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
20	20050	1720	1	0	22.02	1	23.02	20.87	30	7.98
				50	21.55	1	22.55	20.4	30	8.45
				99	21.31	1	22.31	20.16	30	8.69
			50	0	20.62	1	21.62	19.47	30	9.38
				99	20.57	1	21.57	19.42	30	9.43
			100	0	20.56	1	21.56	19.41	30	9.44
	20175	1732.5	1	0	21.89	1	22.89	20.74	30	8.11
				50	21.6	1	22.6	20.45	30	8.4
				99	21.79	1	22.79	20.64	30	8.21
			50	0	20.61	1	21.61	19.46	30	9.39
				99	20.47	1	21.47	19.32	30	9.53
			100	0	20.61	1	21.61	19.46	30	9.39
	20300	1745	1	0	21.87	1	22.87	20.72	30	8.13
				50	21.6	1	22.6	20.45	30	8.4
				99	21.85	1	22.85	20.7	30	8.15
			50	0	20.59	1	21.59	19.44	30	9.41
				99	20.61	1	21.61	19.46	30	9.39
			100	0	20.55	1	21.55	19.4	30	9.45

4.2.4.3.2 LTE Band 12 - QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
1.4	23017	699.7	1	0	22.33	1	23.33	21.18	34.77	12.44
				3	22.45	1	23.45	21.3	34.77	12.32
				5	22.42	1	23.42	21.27	34.77	12.35
			3	0	22.33	1	23.33	21.18	34.77	12.44
				3	22.35	1	23.35	21.2	34.77	12.42
			6	0	21.23	1	22.23	20.08	34.77	13.54
	23095	707.5	1	0	22.15	1	23.15	21	34.77	12.62
				3	22.36	1	23.36	21.21	34.77	12.41
				5	22.21	1	23.21	21.06	34.77	12.56
			3	0	22.25	1	23.25	21.1	34.77	12.52
				3	22.3	1	23.3	21.15	34.77	12.47
			6	0	21.34	1	22.34	20.19	34.77	13.43
	23173	715.3	1	0	22.31	1	23.31	21.16	34.77	12.46
				3	22.4	1	23.4	21.25	34.77	12.37
				5	22.28	1	23.28	21.13	34.77	12.49
			3	0	22.33	1	23.33	21.18	34.77	12.44
				3	22.33	1	23.33	21.18	34.77	12.44
			6	0	21.16	1	22.16	20.01	34.77	13.61

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
3	23025	700.5	1	0	22.52	1	23.52	21.37	34.77	12.25
				8	22.34	1	23.34	21.19	34.77	12.43
				14	22.51	1	23.51	21.36	34.77	12.26
			8	0	21.38	1	22.38	20.23	34.77	13.39
				7	21.4	1	22.4	20.25	34.77	13.37
			15	0	21.38	1	22.38	20.23	34.77	13.39
	23095	707.5	1	0	22.39	1	23.39	21.24	34.77	12.38
				8	22.21	1	23.21	21.06	34.77	12.56
				14	22.35	1	23.35	21.2	34.77	12.42
			8	0	21.27	1	22.27	20.12	34.77	13.5
				7	21.32	1	22.32	20.17	34.77	13.45
			15	0	21.25	1	22.25	20.1	34.77	13.52
	23165	714.5	1	0	22.26	1	23.26	21.11	34.77	12.51
				8	22.21	1	23.21	21.06	34.77	12.56
				14	22.35	1	23.35	21.2	34.77	12.42
			8	0	21.29	1	22.29	20.14	34.77	13.48
				7	21.22	1	22.22	20.07	34.77	13.55
			15	0	21.22	1	22.22	20.07	34.77	13.55

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
5	23035	701.5	1	0	22.24	1	23.24	21.09	34.77	12.53
				13	22.25	1	23.25	21.1	34.77	12.52
				24	22.16	1	23.16	21.01	34.77	12.61
			12	0	21.27	1	22.27	20.12	34.77	13.5
				13	21.22	1	22.22	20.07	34.77	13.55
			25	0	21.28	1	22.28	20.13	34.77	13.49
	23095	707.5	1	0	22.58	1	23.58	21.43	34.77	12.19
				13	22.37	1	23.37	21.22	34.77	12.4
				24	22.31	1	23.31	21.16	34.77	12.46
			12	0	21.24	1	22.24	20.09	34.77	13.53
				13	21.12	1	22.12	19.97	34.77	13.65
			25	0	21.15	1	22.15	20	34.77	13.62
	23155	713.5	1	0	22.25	1	23.25	21.1	34.77	12.52
				13	22.33	1	23.33	21.18	34.77	12.44
				24	22.33	1	23.33	21.18	34.77	12.44
			12	0	21.21	1	22.21	20.06	34.77	13.56
				13	21.31	1	22.31	20.16	34.77	13.46
			25	0	21.29	1	22.29	20.14	34.77	13.48

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
10	23060	704	1	0	22.25	1	23.25	21.1	34.77	12.52
				25	22.34	1	23.34	21.19	34.77	12.43
				49	22.35	1	23.35	21.2	34.77	12.42
			25	0	21.25	1	22.25	20.1	34.77	13.52
				25	21.32	1	22.32	20.17	34.77	13.45
			50	0	21.26	1	22.26	20.11	34.77	13.51
	23095	707.5	1	0	22.25	1	23.25	21.1	34.77	12.52
				25	22.43	1	23.43	21.28	34.77	12.34
				50	22.31	1	23.31	21.16	34.77	12.46
			25	0	21.32	1	22.32	20.17	34.77	13.45
				25	21.21	1	22.21	20.06	34.77	13.56
			50	0	21.15	1	22.15	20	34.77	13.62
	23130	711	1	0	22.42	1	23.42	21.27	34.77	12.35
				25	22.35	1	23.35	21.2	34.77	12.42
				50	22.52	1	23.52	21.37	34.77	12.25
			25	0	21.34	1	22.34	20.19	34.77	13.43
				25	21.27	1	22.27	20.12	34.77	13.5
			50	0	21.29	1	22.29	20.14	34.77	13.48

4.3 Peak to Average Ratio

§24.232(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

§27.50(d)(5) Equipment employed must be authorized in accordance with the provisions of §24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

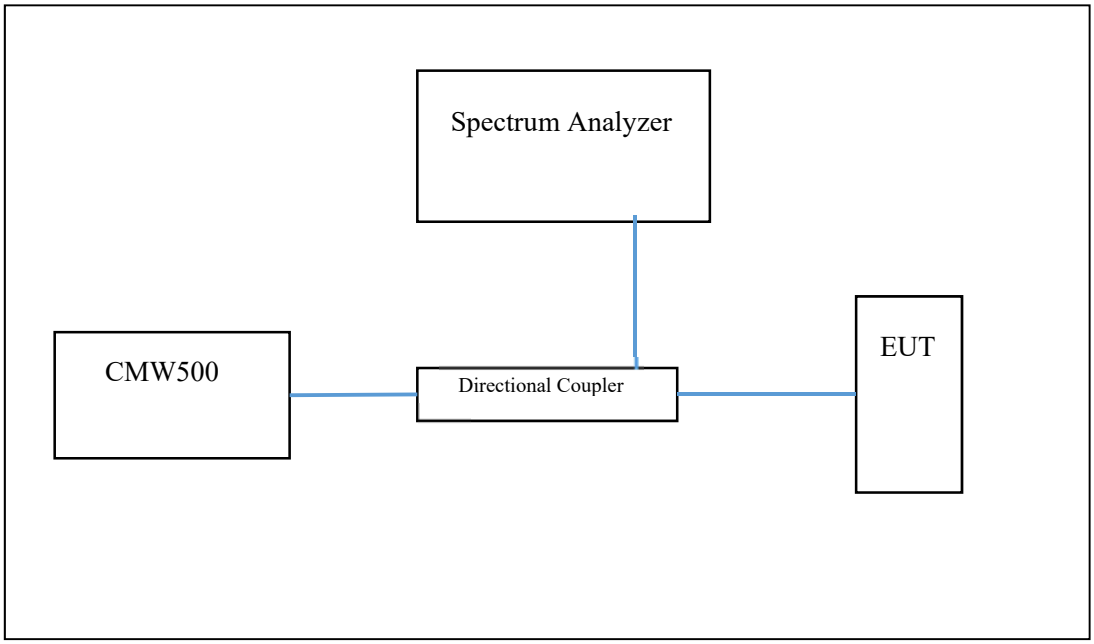
4.3.1 Test Methodology

KDB 971168 D01 V03 and ANSI C63.26-2015 section 5.2.3.4 - Measurement of peak power meter in a broadband noise-like signal using CCDF was used. A CMW500 was used to set the device transmitter with bandwidth, power level, modulation, center frequency and Resource Block configuration (LTE) of interest. In all cases the EUT was set to transmit at maximum power by the CMW500. The EUT was directly connected to a spectrum analyzer with the filling settings:

1. Center frequency set to the EUT's channel center frequency
2. RBW ≥ OBW
3. VBW ≥ RBW

The CCDF's count is set to a value large enough to stabilize the CCDF curve. The measurement interval is set to 1 ms. The final value reported is the Peak-To-Average ratio at 0.1%.

4.3.2 Test Setup



4.3.3 Deviations

N/A

4.3.4 Test Results

4.3.4.1 Part 24

4.3.4.1.1 WCDMA Band 2 – QPSK

Channel Number	Frequency (MHz)	Peak-to-Average Ratio (dB)	Limit	Margin
9262	1852.4	2.77	±13	10.23
9400	1880	2.84	±13	10.16
9538	1907.6	2.74	±13	10.26

4.3.4.1.2 LTE Band 2 – QPSK

Bandwidth	Channel Number	Frequency (MHz)	Resource Blocks (RB)	Peak-to-Average Ratio (dB)	Limit (dB)	Margin
1.4	18607	1850.7	6	4.78	±13	8.22
	18900	1880	6	4.88	±13	8.12
	19193	1909.3	6	4.66	±13	8.34
3	18615	1851.5	15	4.86	±13	8.14
	18900	1880	15	4.95	±13	8.05
	19185	1908.5	15	4.81	±13	8.19
5	18625	1852.5	25	5.00	±13	8
	18900	1880	25	5.02	±13	7.98
	19175	1907.5	25	4.98	±13	8.02
10	18650	1855	50	5.17	±13	7.83
	18900	1880	50	5.17	±13	7.83
	19150	1905	50	5.17	±13	7.83
15	18675	1857.5	75	5.82	±13	7.18
	18900	1880	75	5.70	±13	7.3
	19125	1902.5	75	5.84	±13	7.16
20	18700	1860	100	6.37	±13	6.63
	18900	1880	100	6.32	±13	6.68
	19100	1900	100	6.42	±13	6.58

4.3.4.2 Part 27

4.3.4.2.1 LTE Band 4

Bandwidth	Channel Number	Frequency (MHz)	Resource Blocks (RB)	Peak-to-Average Ratio (dB)	Limit (dB)	Margin
1.4	19957	1710.7	6	4.84	±13	8.16
	20175	1732.5	6	5.03	±13	7.97
	20393	1754.3	6	4.84	±13	8.16
3	19965	1711.5	15	4.84	±13	8.16
	20175	1732.5	15	5.03	±13	7.97
	20385	1753.5	15	4.9	±13	8.1
5	19975	1712.5	25	4.97	±13	8.03
	20175	1732.5	25	5.13	±13	7.87
	20375	1752.5	25	5.16	±13	7.84
10	20000	1715	50	5.13	±13	7.87
	20175	1732.5	50	5.22	±13	7.78
	20350	1750	50	5.22	±13	7.78
15	20025	1717.5	75	5.74	±13	7.26
	20175	1732.5	75	5.77	±13	7.23
	20325	1747.5	75	5.67	±13	7.33
20	20050	1720	100	6.38	±13	6.62
	20175	1732.5	100	6.38	±13	6.62
	20300	1745	100	6.35	±13	6.65

4.4 Bandedge

§2.1051 The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§22.917 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

§24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in

the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

§27.53(h) AWS emission limits (1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB

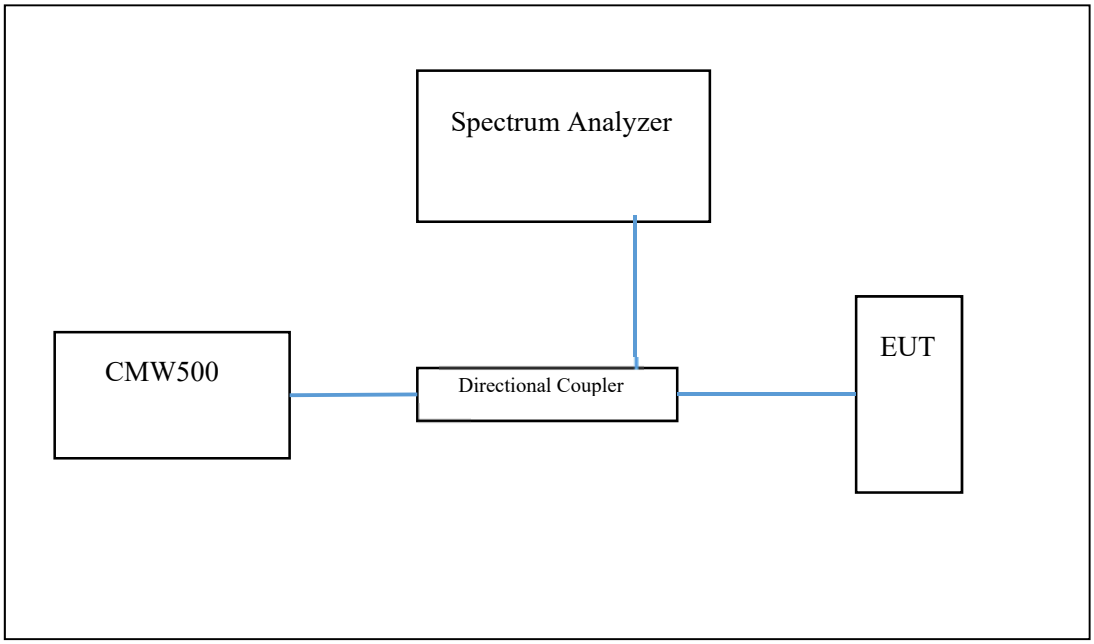
4.4.1 Test Methodology

KDB 971168 D01 v03 section 6 Spurious Emissions at Antenna Port and ANSI C63.26-2015 section 5.7 – Unwanted (out-of-band and spurious emissions) conducted emissions measurement procedures (conducted test at antenna port) were used. The EUT was configured with the CMW 500 to the measured center frequency transmitting at a 100% duty cycle with the correct bandwidth, modulation, and Resource Block configuration in the case of LTE. In all cases the EUT was given the command to transmit at maximum power by the CMW500. The EUT was directly connected to a spectrum analyzer with the following settings:

1. RBW = 100 kHz
2. VBW = 3 MHz
3. Span = 5 MHz
4. Sweep point ≥ 2 x (Span/RBW)
5. Sweep time > sweep points x (symbol period)
6. Detector = power averaging (rms)

Immediately outside the band when a narrower bandwidth is employed the power is integrated over the one MHz span outside the authorized band.

4.4.2 Test Setup



4.4.3 Deviations

N/A

4.4.4 Test Results

4.4.4.1 Part 22

4.4.4.1.1 WCDMA Band 5 – QPSK

Channel Number	Frequency (MHz)	Bandedge Conducted Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
4132	826.4	-20.56	0.5	-20.06	-22.21	-13	9.21
4233	846.6	-20.77	0.5	-20.27	-22.42	-13	9.42

4.4.4.1.2 LTE Band 5 – QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Bandedge Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
1.4	20407	824.7	1	0	-23.06	1	-22.06	-24.21	-13	11.21
			6	0	-24.57	1	-23.57	-25.72	-13	12.72
	20643	848.3	1	5	-21.73	1	-20.73	-22.88	-13	9.88
			6	0	-23.22	1	-22.22	-24.37	-13	11.37
3	20415	825.5	1	0	-22.39	1	-21.39	-23.54	-13	10.54
			6	0	-26.18	1	-25.18	-27.33	-13	14.33
	20635	847.5	1	5	-20.92	1	-19.92	-22.07	-13	9.07
			6	0	-26.58	1	-25.58	-27.73	-13	14.73
5	20425	826.5	1	0	-24.51	1	-23.51	-25.66	-13	12.66
			6	0	-26.95	1	-25.95	-28.1	-13	15.1
	20625	846.5	1	5	-23.63	1	-22.63	-24.78	-13	11.78
			6	0	-27.84	1	-26.84	-28.99	-13	15.99
10	20450	836.6	1	0	-33.93	1	-32.93	-35.08	-13	22.08
			6	0	-29.27	1	-28.27	-30.42	-13	17.42
	20600	844	1	5	-33.49	1	-32.49	-34.64	-13	21.64
			6	0	-29.41	1	-28.41	-30.56	-13	17.56

4.4.4.2 Part 24

4.4.4.2.1 WCDMA Band 2 – QPSK

Channel Number	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.I.R.P (dBm)	Margin (dB)
9262	1852.4	-19.96	0.5	-19.46	-21.61	-13	6.46
9538	1907.6	-19.98	0.5	-19.48	-21.63	-13	6.48

4.4.4.2.2 LTE Band 2 – QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Bandedge Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
1.4	18607	1850.7	1	0	-16.36	1	-15.36	-17.51	-13	4.51
			6	0	-19.65	1	-18.65	-20.8	-13	7.8
	19193	1909.3	1	5	-15.99	1	-14.99	-17.14	-13	4.14
			6	0	-17.74	1	-16.74	-18.89	-13	5.89
3	18615	1851.5	1	0	-16.92	1	-15.92	-18.07	-13	5.07
			6	0	-21.39	1	-20.39	-22.54	-13	9.54
	19185	1908.5	1	5	-16.41	1	-15.41	-17.56	-13	4.56
			6	0	-20.45	1	-19.45	-21.6	-13	8.6
5	18625	1852.5	1	0	-22.09	1	-21.09	-23.24	-13	10.24
			6	0	-25.56	1	-24.56	-26.71	-13	13.71
	19175	1907.5	1	5	-21.67	1	-20.67	-22.82	-13	9.82
			6	0	-23.29	1	-22.29	-24.44	-13	11.44
10	18650	1855	1	0	-32.03	1	-31.03	-33.18	-13	20.18
			6	0	-27.47	1	-26.47	-28.62	-13	15.62
	19150	1905	1	5	-32.10	1	-31.1	-33.25	-13	20.25
			6	0	-27.24	1	-26.24	-28.39	-13	15.39
15	18675	1857.5	1	0	-30.22	1	-29.22	-31.37	-13	18.37
			6	0	-28.26	1	-27.26	-29.41	-13	16.41
	19125	1902.5	1	5	-30.95	1	-29.95	-32.1	-13	19.1
			6	0	-27.41	1	-26.41	-28.56	-13	15.56
20	18700	1860	1	0	-32.76	1	-31.76	-33.91	-13	20.91
			6	0	-29.64	1	-28.64	-30.79	-13	17.79
	19100	1900	1	5	-33.51	1	-32.51	-34.66	-13	21.66
			6	0	-29.3	1	-28.3	-30.45	-13	17.45

4.4.4.3 Part 27

4.4.4.3.1 LTE Band 4 – QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Bandedge Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
1.4	19957	1710.7	1	0	-19.21	1	-18.21	-20.36	-13	7.36
			6	0	-22.70	1	-21.7	-23.85	-13	10.85
	20393	1754.3	1	5	-17.07	1	-16.07	-18.22	-13	5.22
			6	0	-19.95	1	-18.95	-21.1	-13	8.1
3	19965	1711.5	1	0	-19.05	1	-18.05	-20.2	-13	7.2
			6	0	-24.18	1	-23.18	-25.33	-13	12.33
	20385	1753.5	1	5	-17.97	1	-16.97	-19.12	-13	6.12
			6	0	-23.31	1	-22.31	-24.46	-13	11.46
5	19975	1712.5	1	0	-24.25	1	-23.25	-25.4	-13	12.4
			6	0	-26.98	1	-25.98	-28.13	-13	15.13
	20375	1752.5	1	5	-22.90	1	-21.9	-24.05	-13	11.05
			6	0	-25.09	1	-24.09	-26.24	-13	13.24
10	20000	1715	1	0	-33.52	1	-32.52	-34.67	-13	21.67
			6	0	-30.35	1	-29.35	-31.5	-13	18.5
	20350	1750	1	5	-32.92	1	-31.92	-34.07	-13	21.07
			6	0	-26.26	1	-25.26	-27.41	-13	14.41
15	20025	1717.5	1	0	-32.16	1	-31.16	-33.31	-13	20.31
			6	0	-30.92	1	-29.92	-32.07	-13	19.07
	20325	1747.5	1	5	-31.66	1	-30.66	-32.81	-13	19.81
			6	0	-26.59	1	-25.59	-27.74	-13	14.74
20	20050	1720	1	0	-34.80	1	-33.8	-35.95	-13	22.95
			6	0	-34.95	1	-33.95	-36.1	-13	23.1
	20300	1745	1	5	-33.91	1	-32.91	-35.06	-13	22.06
			6	0	-28.70	1	-27.7	-29.85	-13	16.85

4.4.4.3.2 LTE Band 12 – QPSK

Bandwidth (MHz)	Channel Number	Frequency (MHz)	Resource Blocks (RB)	RB Position	Bandedge Conducted Power (dBm)	Gain (dBi)	E.I.R.P (dBm)	E.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)
1.4	23017	699.7	1	0	-22.21	1	-21.21	-23.36	-13	10.36
			6	0	-17.88	1	-16.88	-19.03	-13	6.03
	23173	715.3	1	5	-22.06	1	-21.06	-23.21	-13	10.21
			6	0	-21.48	1	-20.48	-22.63	-13	9.63
3	23025	700.5	1	0	-21.24	1	-20.24	-22.39	-13	9.39
			6	0	-18.90	1	-17.9	-20.05	-13	7.05
	23165	714.5	1	5	-20.87	1	-19.87	-22.02	-13	9.02
			6	0	-24.57	1	-23.57	-25.72	-13	12.72
5	23035	701.5	1	0	-23.06	1	-22.06	-24.21	-13	11.21
			6	0	-20.66	1	-19.66	-21.81	-13	8.81
	23155	713.5	1	5	-24.66	1	-23.66	-25.81	-13	12.81
			6	0	-26.13	1	-25.13	-27.28	-13	14.28
10	23060	704	1	0	-32.39	1	-31.39	-33.54	-13	20.54
			6	0	-23.82	1	-22.82	-24.97	-13	11.97
	23130	711	1	5	-33.13	1	-32.13	-34.28	-13	21.28
			6	0	-26.14	1	-25.14	-27.29	-13	14.29

4.5 Spurious Emissions at the Antenna Terminals

§2.1051 The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§22.917 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

§24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in

the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

§27.53(h) AWS emission limits (1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB

4.5.1 Test Methodology

4.5.1.1 Spurious Unwanted Emissions measurement

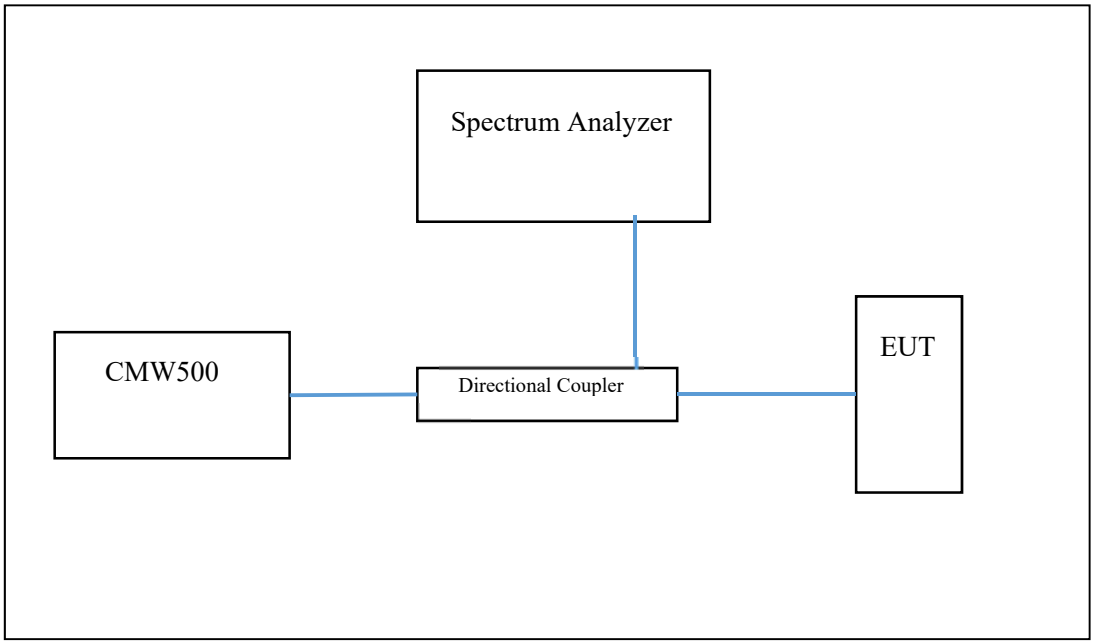
KDB 971168 D01 v03 section 6 Spurious Emissions at Antenna Port and ANSI C63.26-2015 section 5.7 – Unwanted (out-of-band and spurious emissions) conducted emissions measurement procedures (conducted test at antenna port) were used. The EUT was configured with the CMW 500 to the measured center frequency transmitting at a 100% duty cycle with the correct bandwidth, modulation, and Resource Block configuration in the case of LTE. In all cases the EUT was given the command to transmit at maximum power by the CMW500. The EUT was directly connected to a spectrum analyzer with the following settings:

1. Below 1 GHz:
    a. RBW = 100 kHz
    b. VBW = 3 MHz
    c. Span = 970MHz
    d. Sweep point ≥ 2 x (Span/RBW)
    e. Sweep time > sweep points x (symbol period)
    f. Detector = power averaging (rms)

2. Above 1 GHz
    a. RBW = 1 MHz
    b. VBW = 3 MHz
    c. Span = 6GHz to 20 GHz
    d. Sweep Points = 2 x (Span/RBW)
    e. Sweep Time > sweep points x (symbol period)
    f. Detector = power averaging (rms)

Worst case configuration is tested and was determined by power measurement performed in section 4.2 of this report. The modulation, frequency, resource block configuration, in the case of LTE, are chosen based on this power.

4.5.2 Test Setup



4.5.3 Deviations

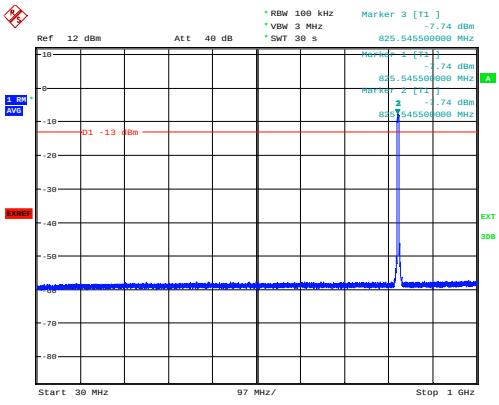
N/A

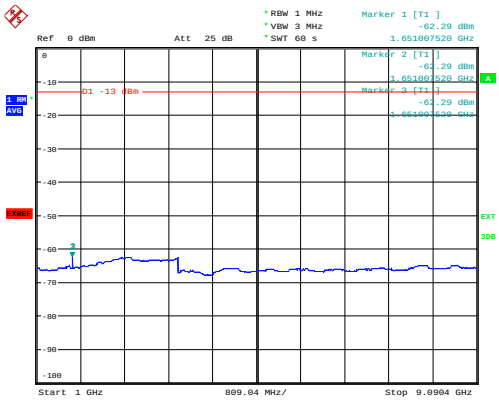
4.5.4 Test Results

4.5.4.1 Part 22

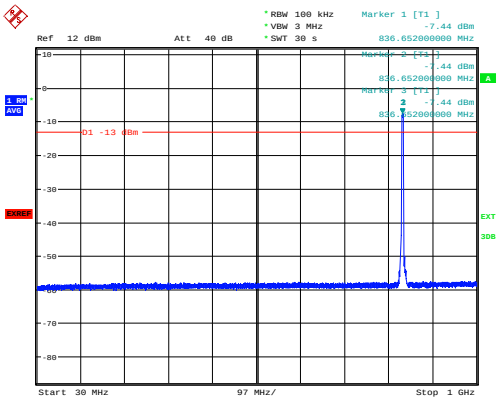
4.5.4.1.1 WCDMA Band 5

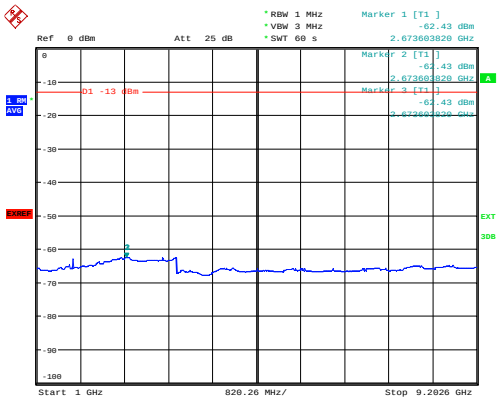
Channel 4132



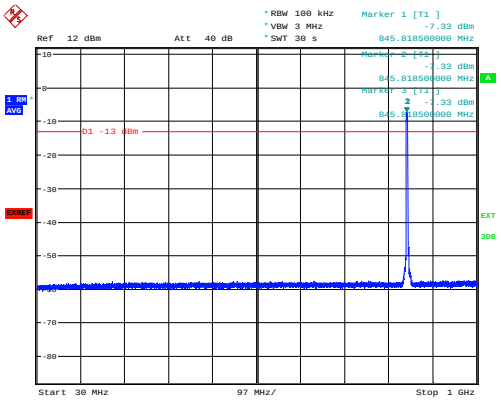


Channel 4183

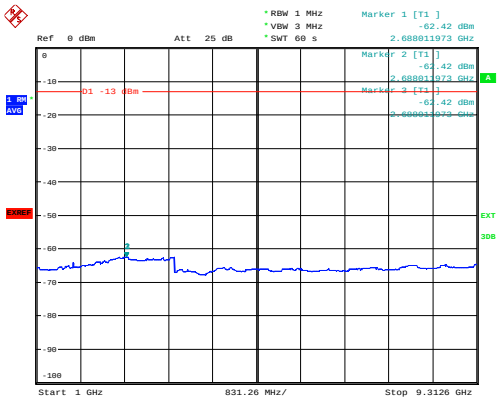




Channel 4233



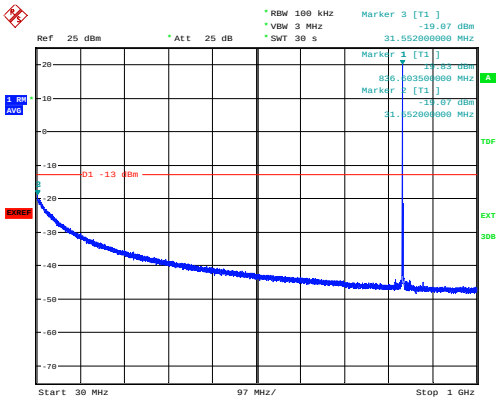
Date: 27.MAR.2018 11:18:46



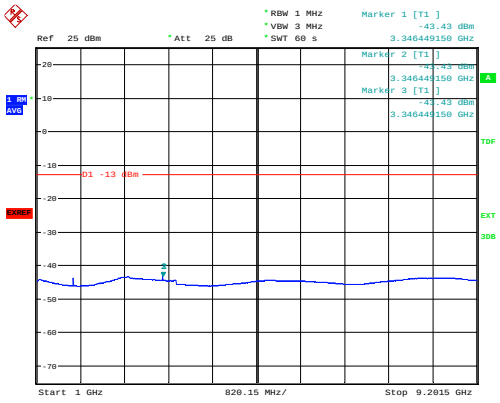
Date: 27.MAR.2018 11:19:58

4.5.4.1.2 LTE Band 5

1.4 MHz – CH 20525 – RB# 1 – RBPos: 3

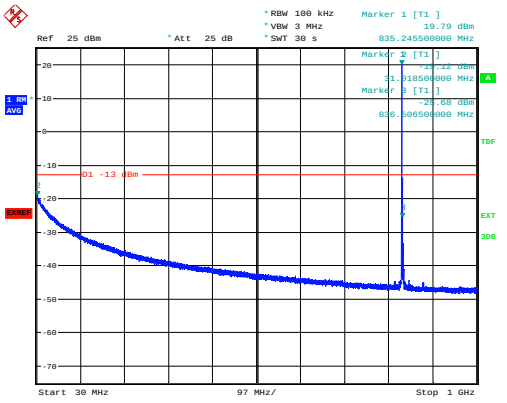


Date: 5.APR.2018 15:15:23

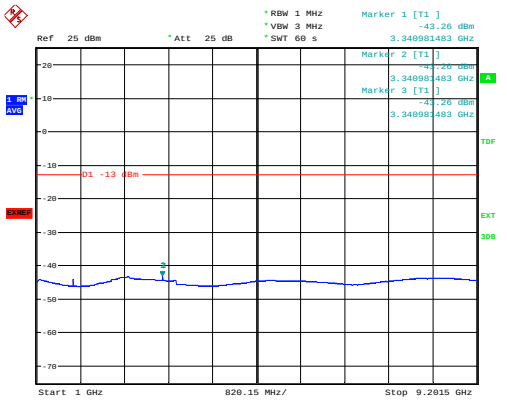


Date: 5.APR.2018 15:16:35

3 MHz – CH 20525 – RB# 1 – RBPos: 0

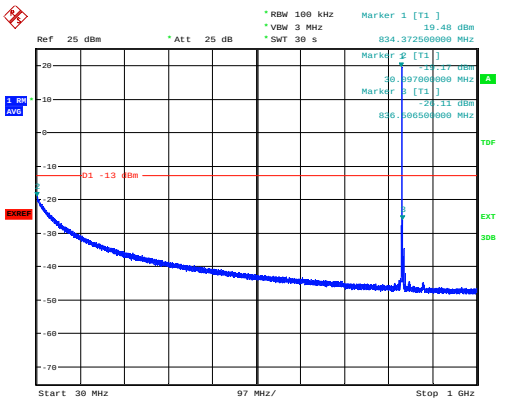


Date: 5.APR.2018 15:17:21

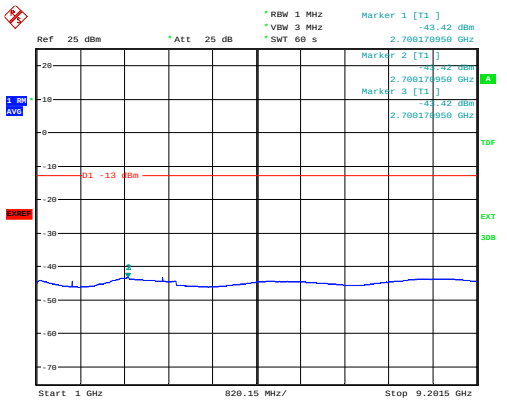


Date: 5.APR.2018 15:18:34

5 MHz – CH 20525 – RB# 1 – RBPos: 0

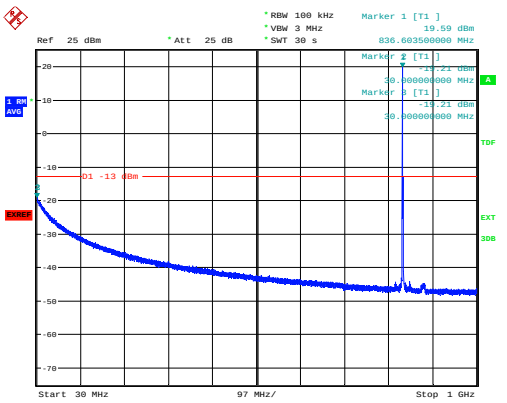


Date: 5.APR.2018 15:19:19



Date: 5.APR.2018 15:20:32

10 MHz – CH 20525 – RB# 1 – RBPos: 25



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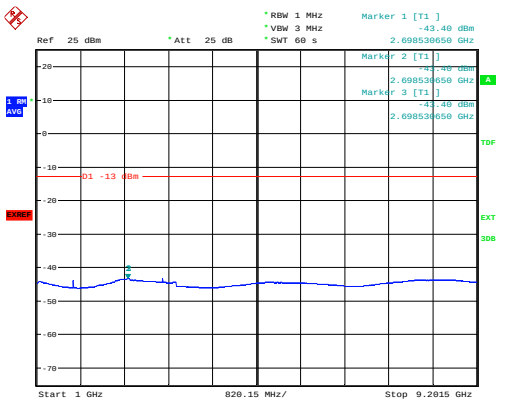
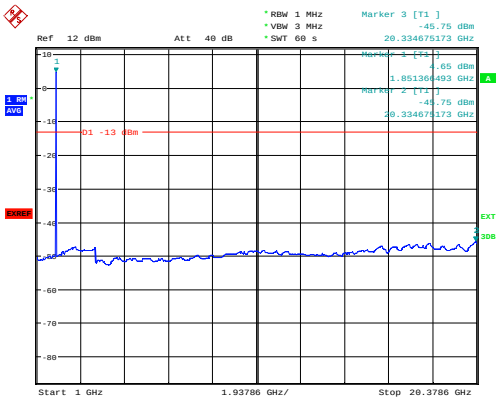


Date: 5.APR.2018 15:22:31

4.5.4.2 **Part 24**

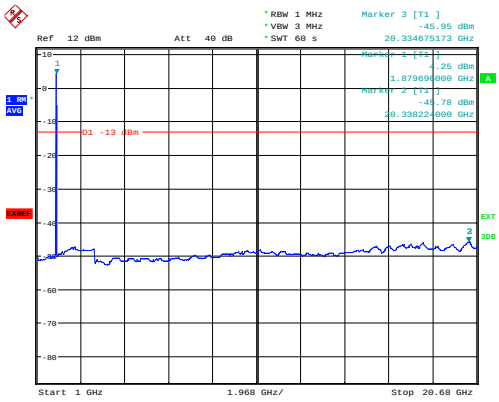
4.5.4.2.1 WCDMA Band 2

Channel 9262



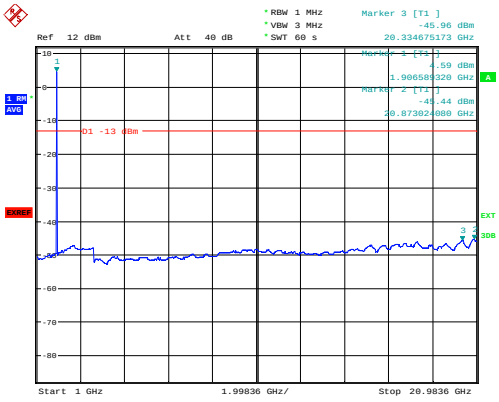
Date: 27.MAR.2018 11:22:59

Channel 9400



Date: 27.MAR.2018 11:24:13

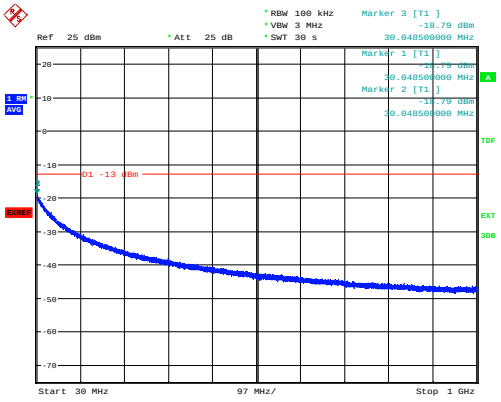
Channel 9538



Date: 27.MAR.2018 11:25:27

4.5.4.2.2 LTE Band 2

1.4 MHz – CH 18900 – RB# 1 – RBPos: 0



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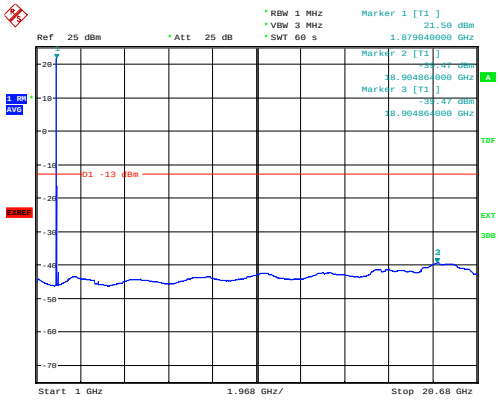
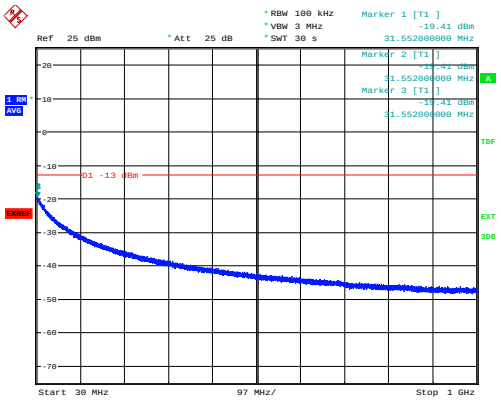


Date: 5.APR.2018 14:36:04

3 MHz – CH 18900 – RB# 1 – RBPos: 0



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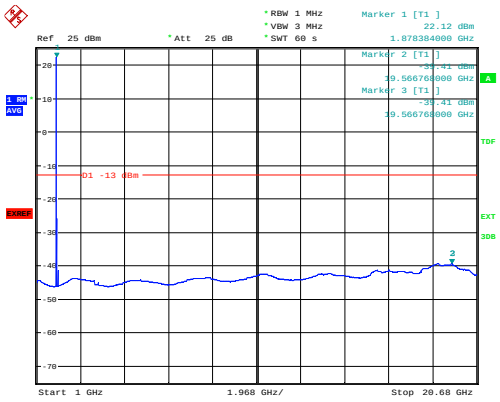
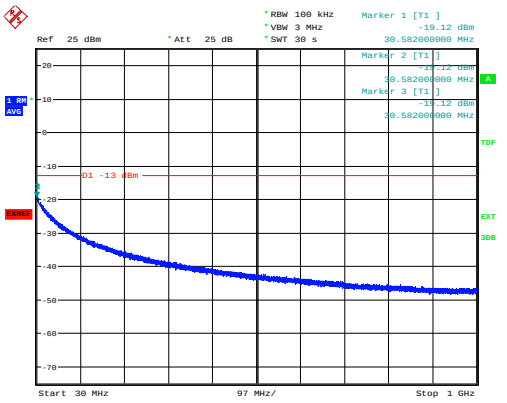


Date: 5.APR.2018 14:38:02

5 MHz – CH 18900 – RB# 1 – RBPos: 0



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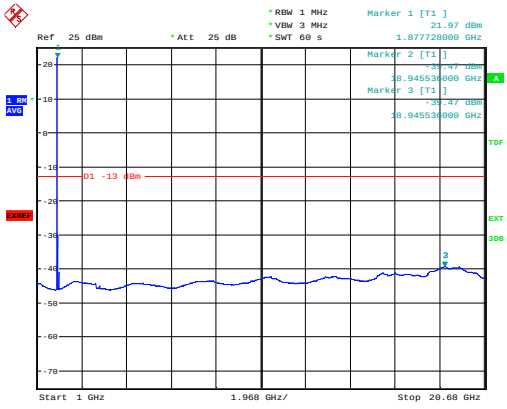

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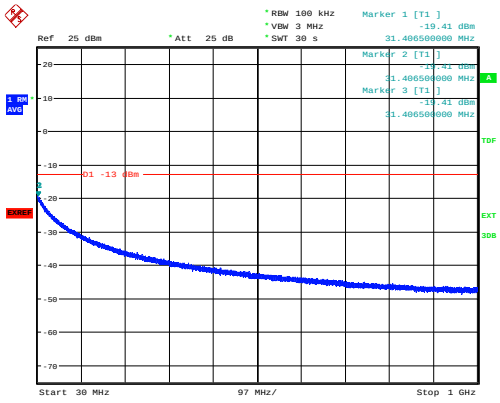
10 MHz – CH 18900 – RB# 1 – RBPos: 3



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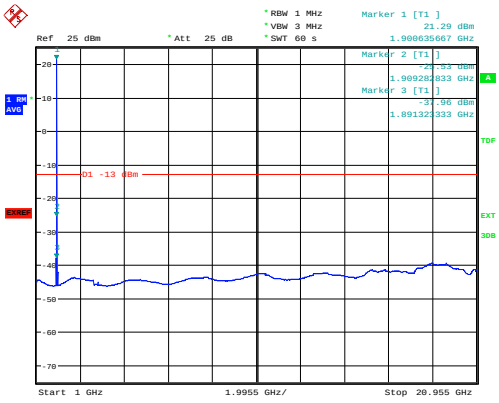

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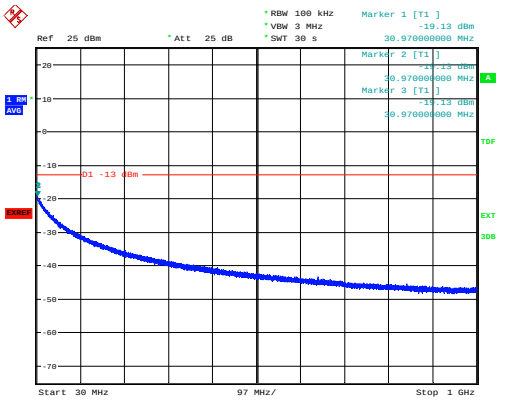
15 MHz – CH 18900 – RB# 1 – RBPos: 3



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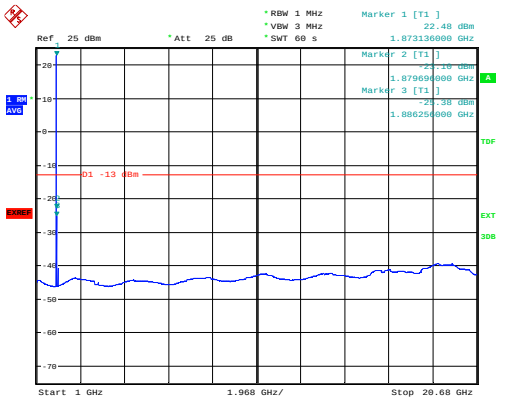
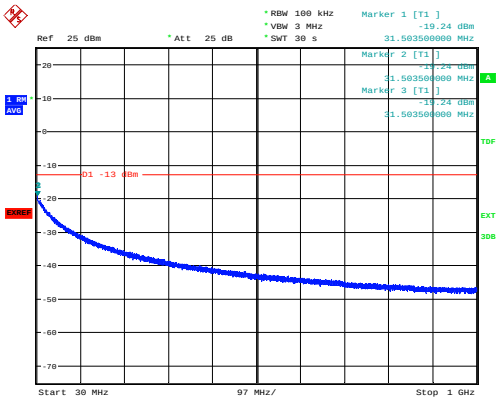


Date: 5.APR.2018 14:43:58

20 MHz – CH 18900 – RB# 1 – RBPos: 99



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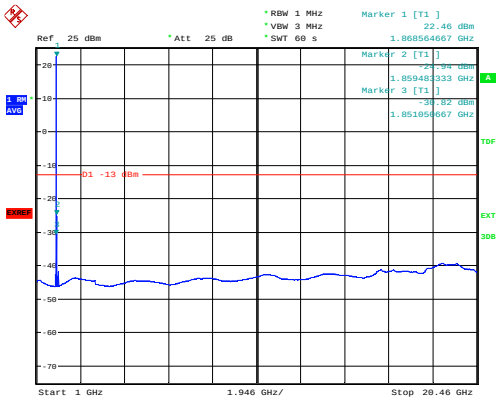
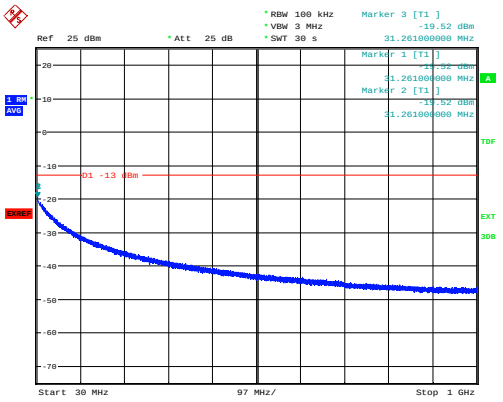


Date: 5.APR.2018 14:45:56

4.5.4.3 **Part 27**

4.5.4.3.1 LTE Band 4

1.4 MHz – CH 20393 – RB# 1 – RBPos: 0



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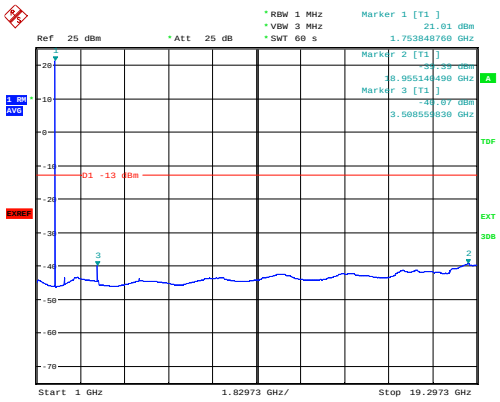
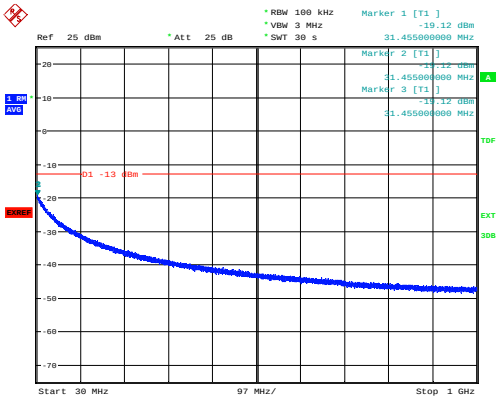


Date: 5.APR.2018 15:01:46

3 MHz – CH 19965 – RB# 1 – RBPos: 14



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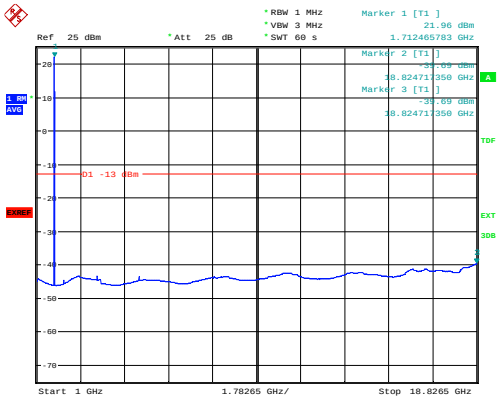

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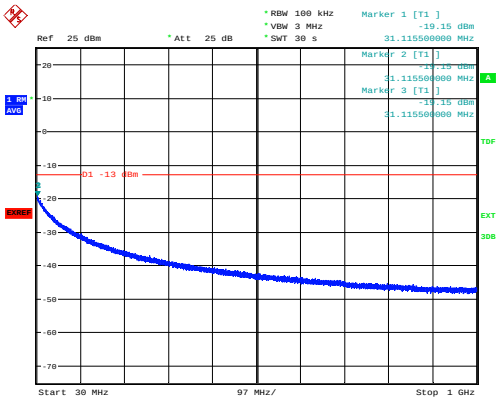
5 MHz – CH 20175 – RB# 1 – RBPos: 3



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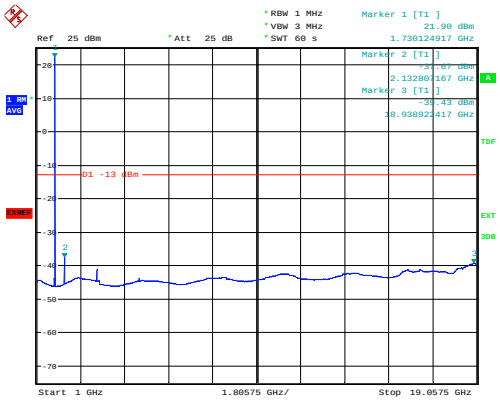
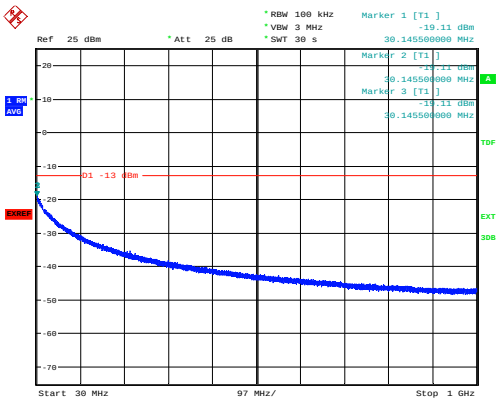


Date: 5.APR.2018 15:05:43

10 MHz – CH 20350 – RB# 1 – RBPos: 0



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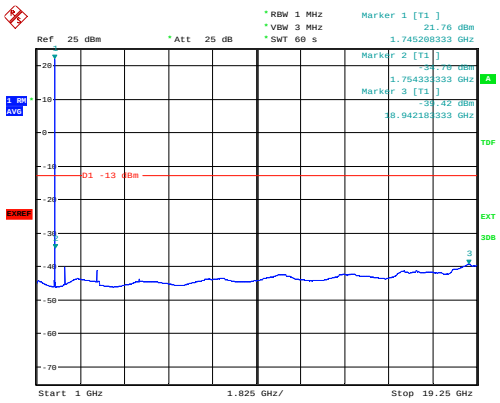
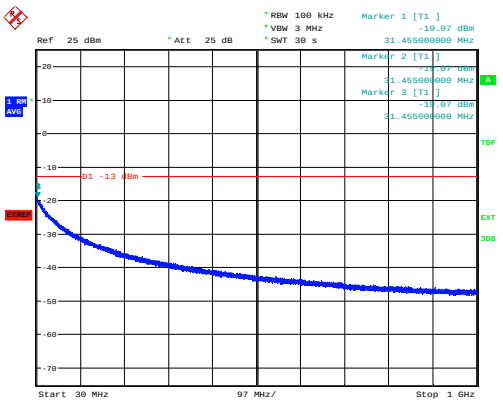


Date: 5.APR.2018 15:07:41

15 MHz – CH 20325 – RB# 1 – RBPos: 74



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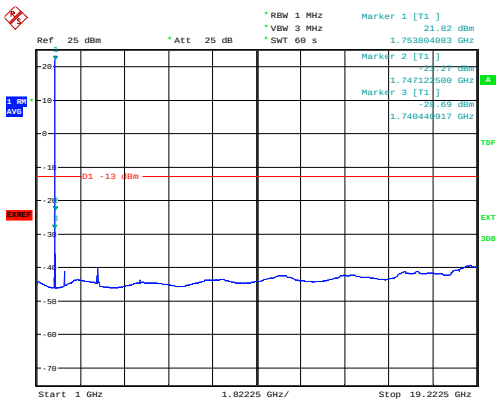
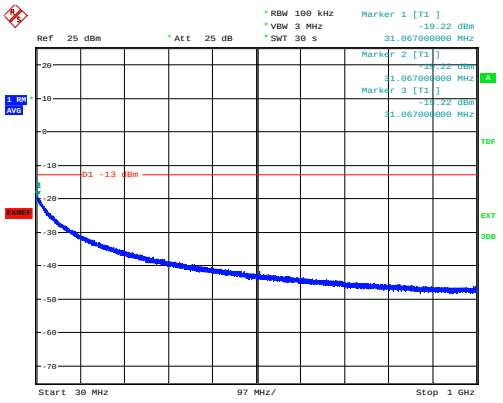
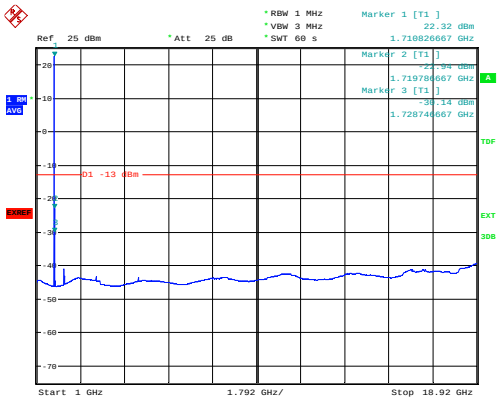


Date: 5.APR.2018 15:09:40

20 MHz – CH 20050 – RB# 1 – RBPos: 0



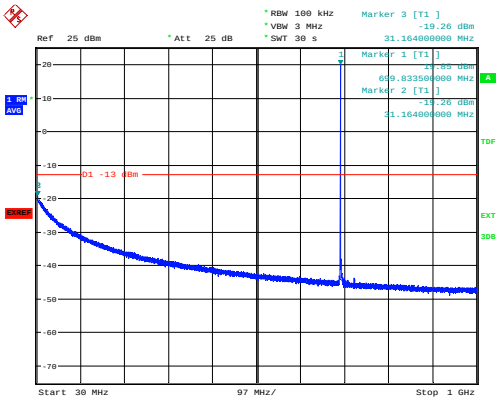
Date: 5.APR.2018 15:10:26



Date: 5.APR.2018 15:11:38

4.5.4.3.2 LTE Band 12

1.4 MHz – CH 23017 – RB# 1 – RBPos: 3



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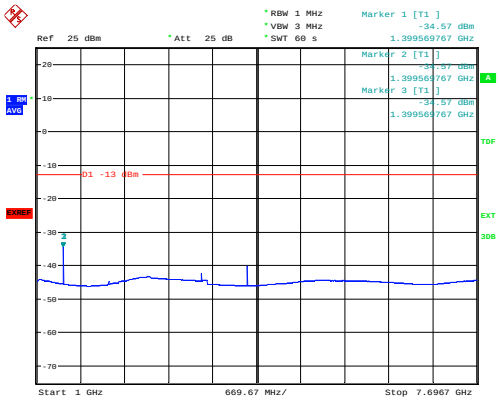
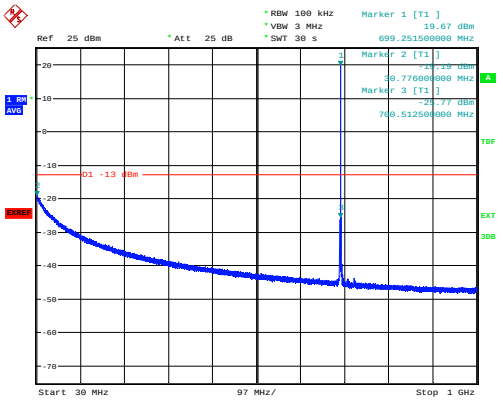


Date: 5.APR.2018 15:30:15

3 MHz – CH 23025 – RB# 1 – RBPos: 0



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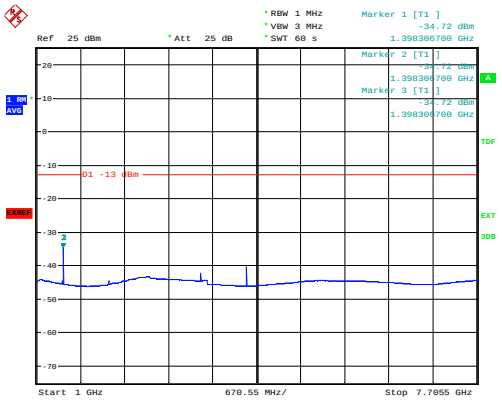
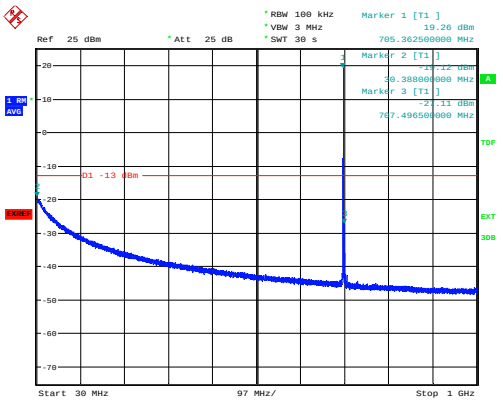
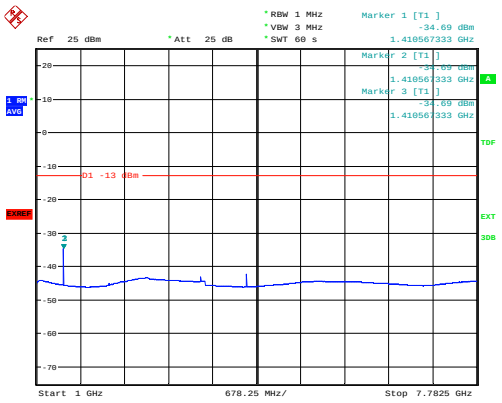


Date: 5.APR.2018 15:32:13

5 MHz – CH 23090 – RB# 1 – RBPos: 0

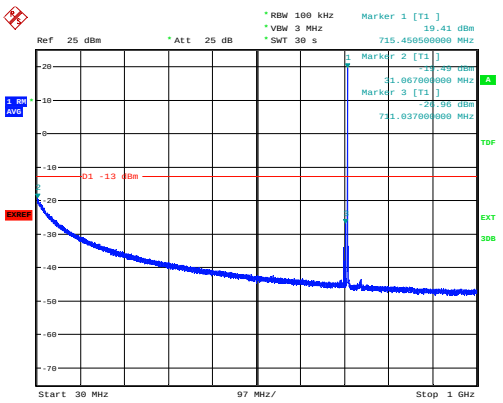


Date: 5.APR.2018 15:32:59

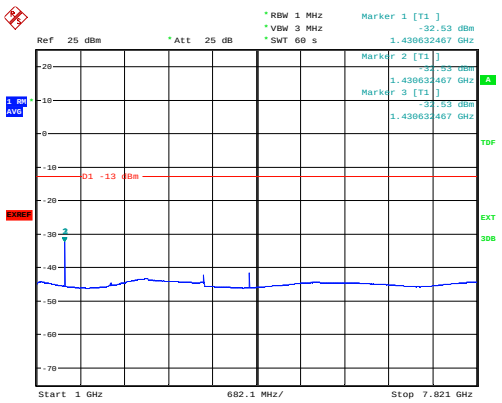


Date: 5.APR.2018 15:34:11

10 MHz – CH 23130 – RB# 1 – RBPos: 50



Date: 5.APR.2018 15:34:57



Date: 5.APR.2018 15:36:09

4.6 Frequency Stability

§2.1055 (a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

§22.355 Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

§24.235 The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

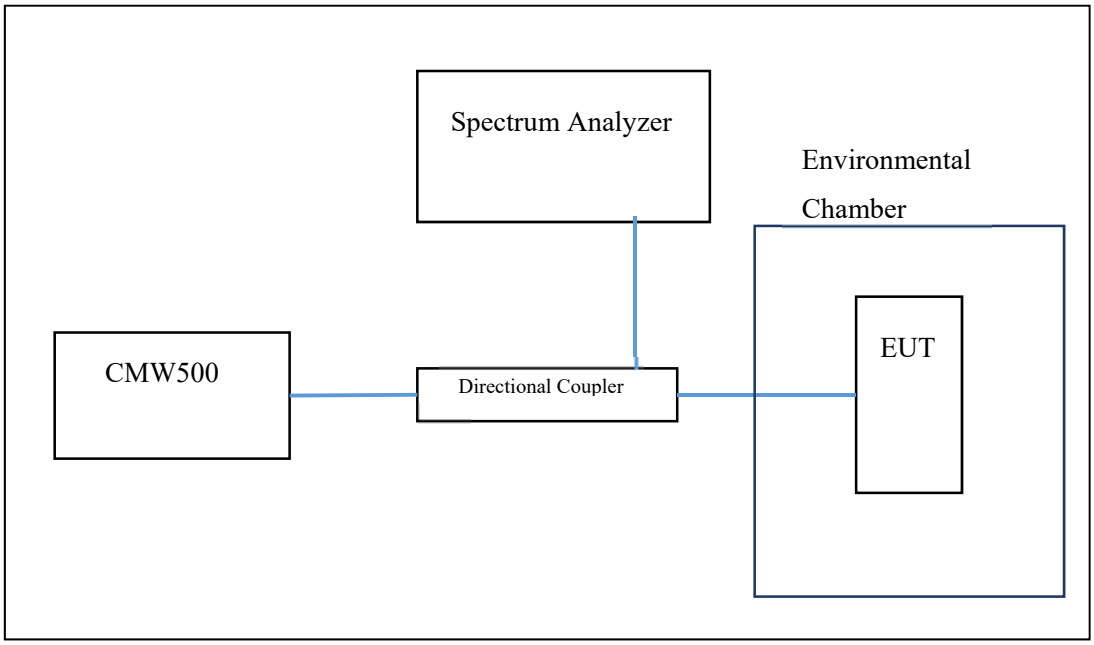
§27.54 The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.6.1 Test Methodology

KDB 971168 D01 v03r01 section 9 and ANSI C63.26-2015 section 5.6.3 – Procedure for stability testing were used. The EUT was configured with the CMW 500 to the measured center frequency transmitting at a 100% duty cycle with the correct bandwidth, modulation, and Resource Block configuration in the case of LTE. In all cases the EUT was given the command to transmit at maximum power by the CMW500. The temperature frequency stability was measured -30º to 50º degrees Celsius by 10º degree steps. The device was allowed to cold soak at each temperature for 30 mins (minimum) before the transmitter was turned on, connected and measurement made. The voltage frequency stability was measured from ±15% of the operating voltage. The CMW500 was used directly to frequency stability in Hz. This value was then converted to ppm via the following function:

$$ppm = F(Hz)/F(MHz)$$

4.6.2 Test Setup



4.6.3 Test Data

4.6.3.1 Part 22

4.6.3.1.1 WCMDA Band 5

Bandwidth (MHz)	Channel	Frequency (MHz)	Voltage (V)	Temperature (Celsius)	Frequency Variation (Hz)	Frequency Variation (PPM)	Limit (PPM)	Margin (PPM)
5	4138	836.5	Normal	-30	3.74	0.004	±2.5	2.50
				-20	-7.03	-0.008	±2.5	2.49
				-10	-4.35	-0.005	±2.5	2.49
				0	-4.84	-0.006	±2.5	2.49
				10	2.78	0.003	±2.5	2.50
				20	4.46	0.005	±2.5	2.49
				30	7.12	0.009	±2.5	2.49
				40	6.84	0.008	±2.5	2.49
				50	6.07	0.007	±2.5	2.49
			15%	normal	5.55	0.007	±2.5	2.49
			-15%		4.61	0.006	±2.5	2.49

4.6.3.1.2 LTE Band 5

Bandwidth (MHz)	Channel	Frequency (MHz)	Voltage (V)	Temperature (Celsius)	Frequency Variation (Hz)	Frequency Variation (PPM)	Limit (PPM)	Margin (PPM)
1.4	20525	836.5	Normal	-30	-7.14	-0.009	±2.5	2.49
				-20	3.89	0.005	±2.5	2.50
				-10	4.45	0.005	±2.5	2.49
				0	4.61	0.006	±2.5	2.49
				10	-4.19	-0.005	±2.5	2.49
				20	-3.92	-0.005	±2.5	2.50
				30	-4.29	-0.005	±2.5	2.49
				40	-4.08	-0.005	±2.5	2.50
				50	-4.72	-0.006	±2.5	2.49
			15%	20	-4.98	-0.006	±2.5	2.49
			-15%		-4.08	-0.005	±2.5	2.50

4.6.3.2 **Part 24**

4.6.3.2.1 WCDMA Band 2

Channel	Frequency (MHz)	Voltage (V)	Temperature (Celsius)	Frequency Variation (Hz)	Frequency Variation (PPM)	Limit (PPM)	Margin (PPM)
9400	1880	Normal	-30	-2.91	-0.002	N/A	
			-20	-7.22	-0.004	N/A	
			-10	-9.46	-0.005	N/A	
			0	-8.33	-0.004	N/A	
			10	-4.33	-0.002	N/A	
			20	-6.97	-0.004	N/A	
			30	6.85	0.004	N/A	
			40	10.43	0.006	N/A	
			50	9.82	0.005	N/A	
		15%	20	8.04	0.004	N/A	
		-15%		8.59	0.005	N/A	

4.6.3.2.2 LTE Band 2

Bandwidth (MHz)	Channel	Frequency (MHz)	Voltage (V)	Temperature (Celsius)	Frequency Variation (Hz)	Frequency Variation (PPM)	Limit (PPM)	Margin (PPM)
1.4	18900	1880	Normal	-30	-7.91	-0.004	N/A	N/A
				-20	-9.1	-0.005	N/A	N/A
				-10	-9.53	-0.005	N/A	N/A
				0	-9.08	-0.005	N/A	N/A
				10	-10.07	-0.005	N/A	N/A
				20	-9.74	-0.005	N/A	N/A
				30	-9.97	-0.005	N/A	N/A
				40	-11.04	-0.006	N/A	N/A
				50	-9.31	-0.005	N/A	N/A
			15%	20	-9.97	-0.005	N/A	N/A
			-15%		-9.73	-0.005	N/A	N/A

4.6.3.3 **Part 27**

4.6.3.3.1 LTE Band 4

Bandwidth (MHz)	Channel	Frequency (MHz)	Voltage (V)	Temperature (Celsius)	Frequency Variation (Hz)	Frequency Variation (PPM)	Limit (PPM)	Margin (PPM)
1.4	20175	1732.5	Normal	-30	7.31	0.004	N/A	N/A
				-20	6.69	0.004	N/A	N/A
				-10	6.69	0.004	N/A	N/A
				0	5.36	0.003	N/A	N/A
				10	8.31	0.005	N/A	N/A
				20	-6.82	-0.004	N/A	N/A
				30	-7.5	-0.004	N/A	N/A
				40	-8.97	-0.005	N/A	N/A
				50	-8.05	-0.005	N/A	N/A
			15%	20	-5.87	-0.003	N/A	N/A
			-15%		-5.99	-0.003	N/A	N/A

4.6.3.3.2 LTE band 12

Bandwidth (MHz)	Channel	Frequency (MHz)	Voltage (V)	Temperature (Celsius)	Frequency Variation (Hz)	Frequency Variation (PPM)	Limit (PPM)	Margin (PPM)
1.4	18900	1880	Normal	-30	5.28	0.003	N/A	N/A
				-20	-4.06	-0.002	N/A	N/A
				-10	3.66	0.002	N/A	N/A
				0	3.91	0.002	N/A	N/A
				10	-5.15	-0.003	N/A	N/A
				20	-4.79	-0.003	N/A	N/A
				30	-6.98	-0.004	N/A	N/A
				40	-5.11	-0.003	N/A	N/A
				50	-4.18	-0.002	N/A	N/A
			15%	20	-4.16	-0.002	N/A	N/A
			-15%		-5.42	-0.003	N/A	N/A

4.7 Transmitter Unwanted Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmitting mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS-Gen Sect. 8.9

4.7.1 Test Methodology

4.7.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emissions test procedure. The frequency range of interest was divided into sub-ranges. For each sub-range peak emission data was recorded and plotted while the turntable was rotated 360° in 90° steps and the measurement antenna was rotated in horizontal and vertical antenna polarization.

Preliminary emission profile testing was performed inside a semi-anechoic chamber. The EUT was placed on a non-conductive table 80 cm above the floor for emissions less than 1 GHz and 150cm above the floor for emissions greater than 1 GHz. The EUT was positioned as shown in the setup photographs. The measurement antenna was placed at a distance of 3m.

4.7.1.2 Final Test

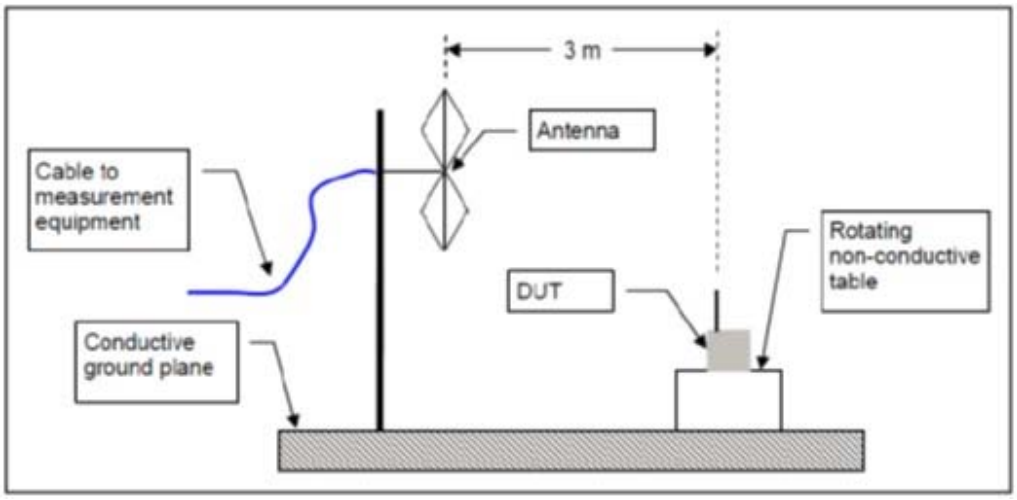
Final testing was performed on an NSA compliant test site.

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. Emissions within 20 dB of the limit were measured.

Substitution measurements are done for emissions within 10 dB of the limit.

The final scans were performed on the worst EUT axis for three operating channels in the operating mode with the highest power.

4.7.1.3 Test Setup



4.7.1.4 Deviations

None.

4.7.2 Transmitter Spurious Emission Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB where P is in watts. The limit is -13 dBm for any power.

4.7.3 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and cable positions. It also reflects the results including any modifications and/or special accessories listed in section 1

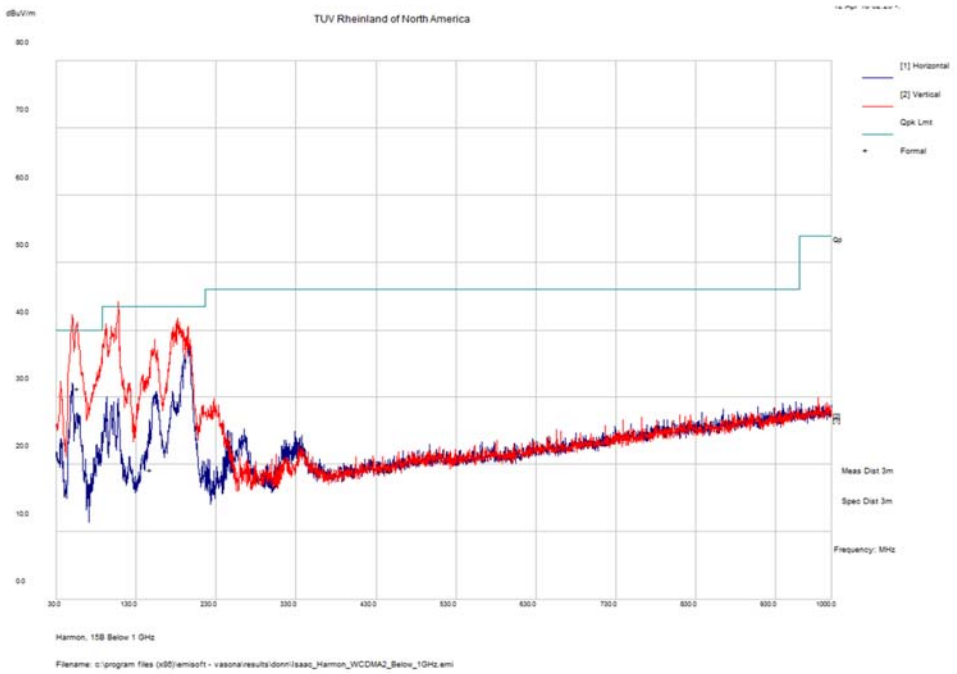
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1852.4 MHz/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Bi-Log Antenna	**Engineer**	Isaac Aguilar

30 MHz – 1 GHz

Frequency MHz	Raw dBuV/m	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB
107.4175	50.17	2.56	-16.05	36.69	Quasi Max	V	109	11	43.5	-6.81
50.4293	53.56	2.38	-19.9	36.05	Quasi Max	V	173	58	40	-3.96
181.5068	50.12	2.74	-16.77	36.08	Quasi Max	V	119	170	43.5	-7.42

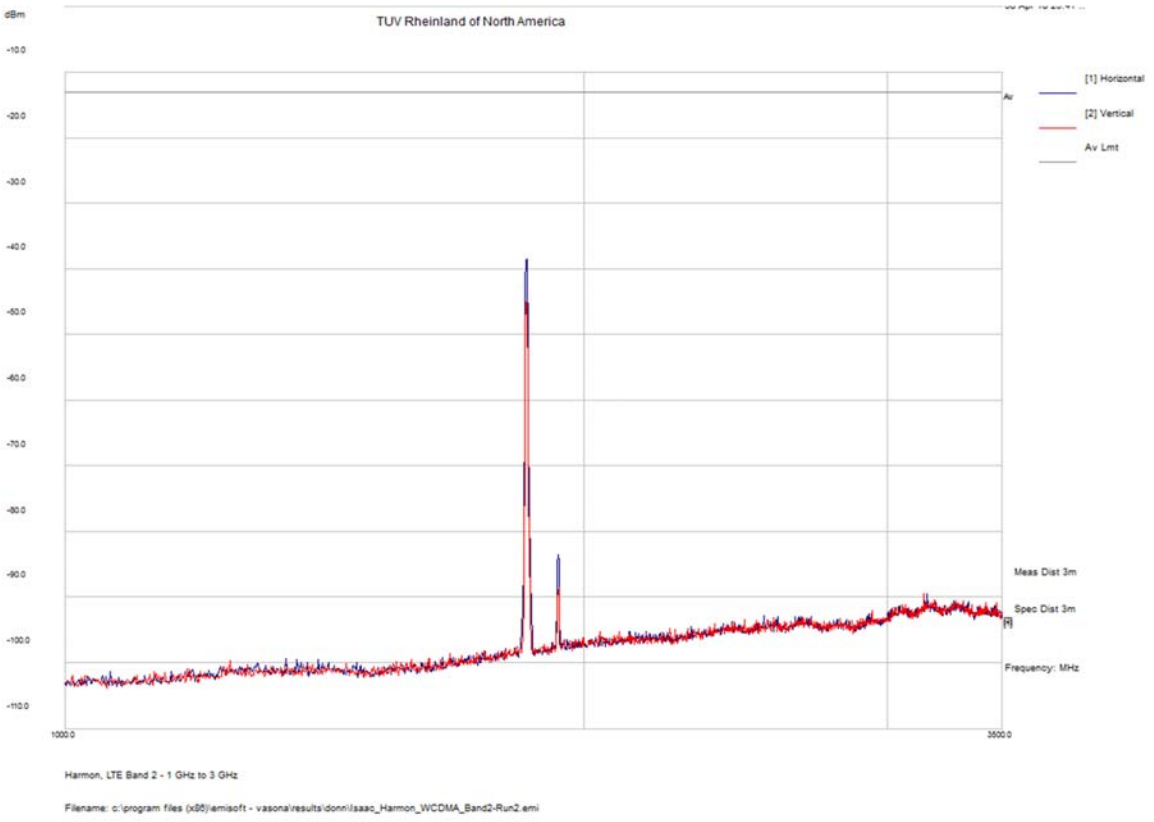


Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1852.4 MHz/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

1 GHz – 3.5 GHz

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB
1853.125	-16.48	2.2	-24.24	-38.52	Peak [Scan]	H	200	0	-13	-25.52
1932.768	-61.67	2.27	-24.08	-83.49	Peak [Scan]	V	100	0	-13	-70.49



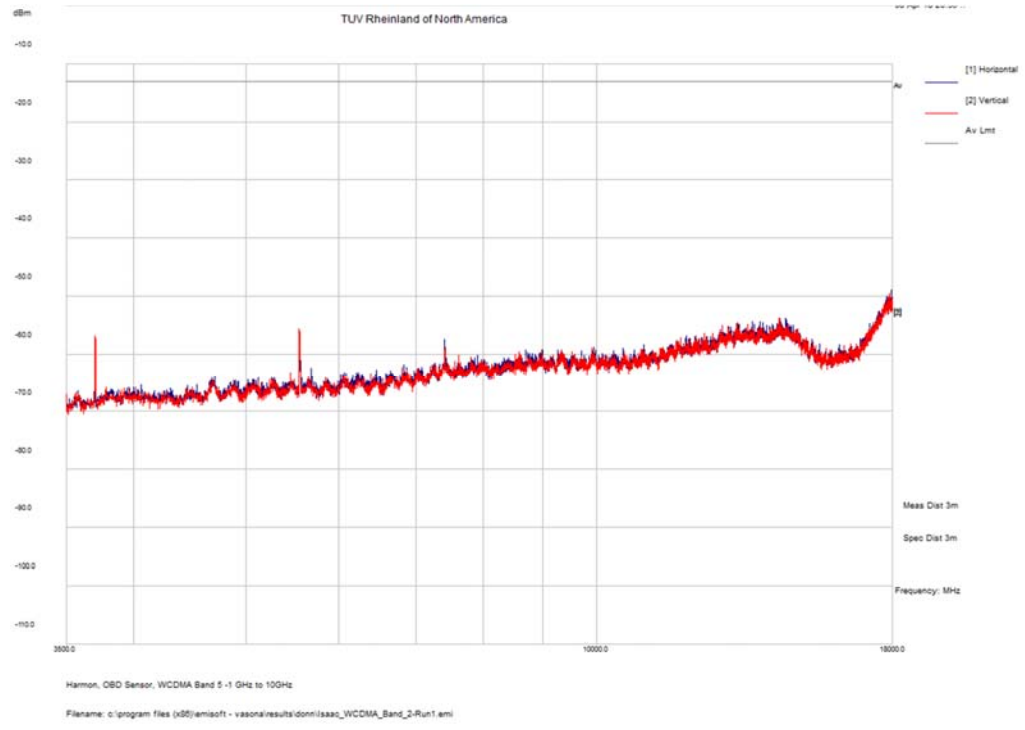
Peak above the limit is the uplink carrier frequency

Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1852.4 MHz/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

3.5 GHz – 18 GHz

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB
3702.192	-44	3.1	-19.45	-60.35	Peak [Scan]	V	101	0	-13	-47.35
5559.452	-43.58	3.7	-18.01	-57.89	Peak [Scan]	V	101	0	-13	-44.89
7406.015	-48.73	4.3	-13.21	-57.64	Peak [Scan]	V	101	0	-13	-44.64

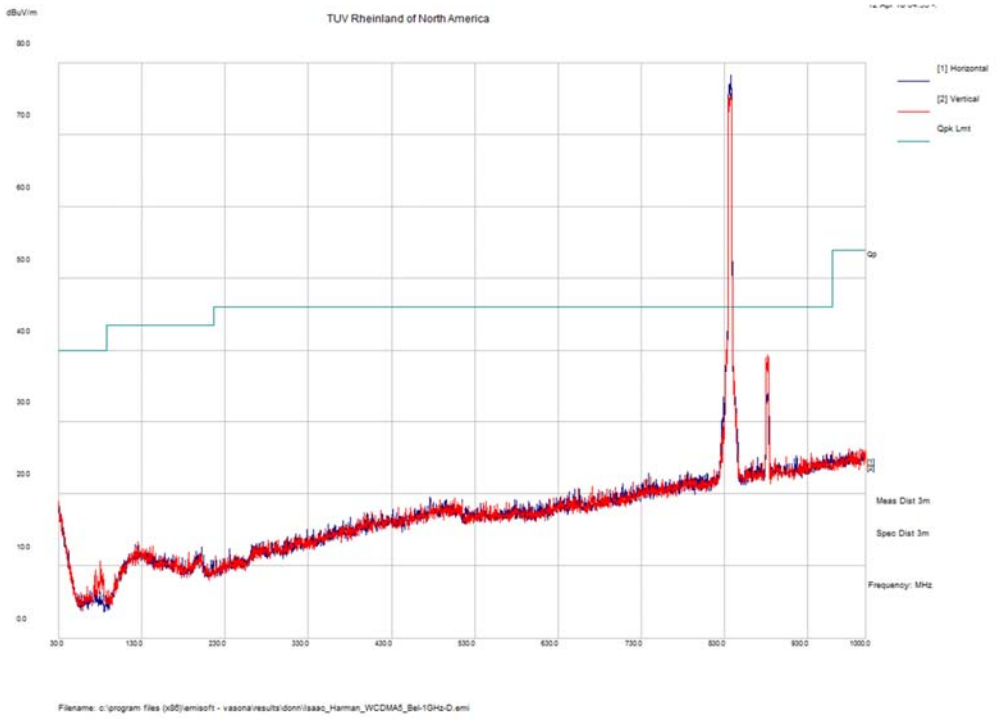


Radiated Emissions – WCDMA Band 5 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	836.6 MHz/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Bi-Log Antenna	**Date**	Isaac Aguilar

30 MHz – 1 GHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB
838.13125	80.18	3.62	-5.53	78.26	Peak [Scan]	H	200	105	46	32.26
839.95	43.25	3.62	-5.56	41.31	Peak [Scan]	H	200	105	46	-4.69
881.478125	40.55	3.66	-4.83	39.37	Peak [Scan]	V	200	272	46	-6.63

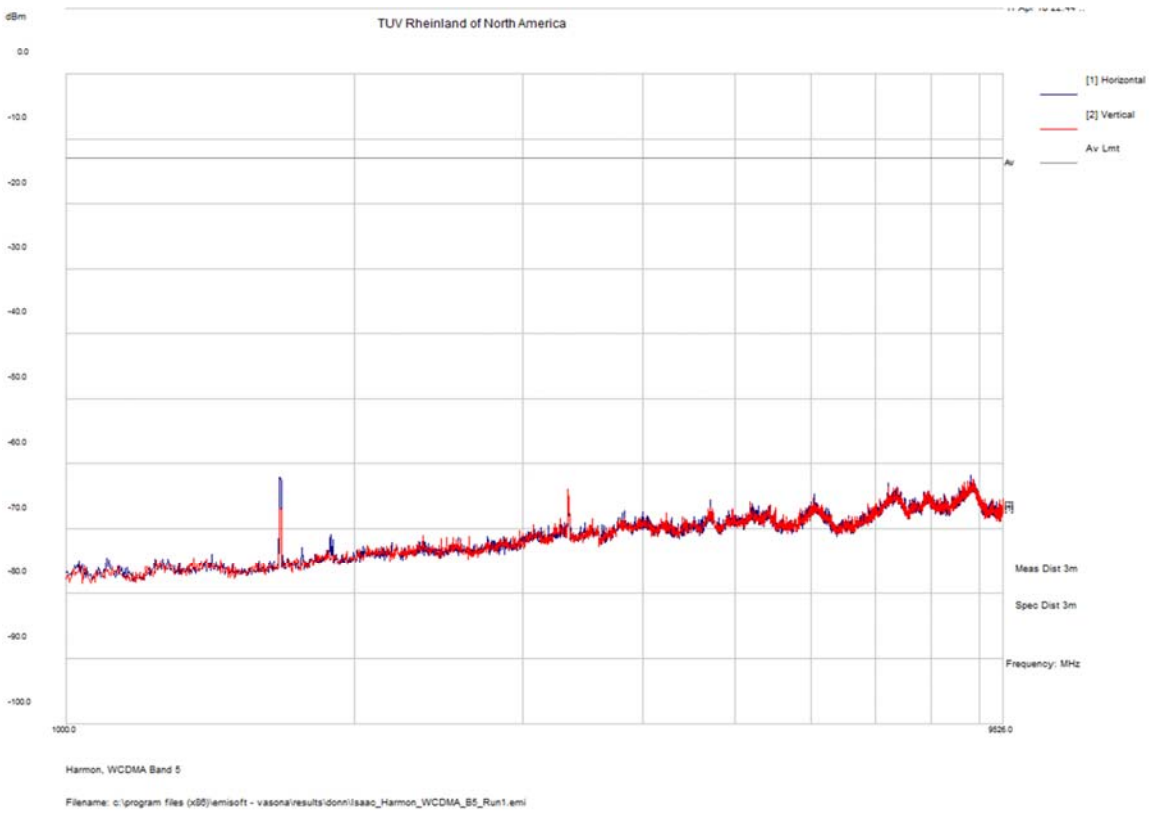


Radiated Emissions – WCDMA Band 5 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	836.6 MHz/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

1 GHz – 10 GHz

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB
1673.713	-38.47	2.1	-25.79	-62.16	Peak [Scan]	V	100	368	-13	-49.16
1886.094	-50.37	2.2	-24.12	-72.29	Peak [Scan]	V	100	368	-13	-59.29
3339.775	-50.16	2.9	-20.51	-67.77	Peak [Scan]	V	100	368	-13	-54.77

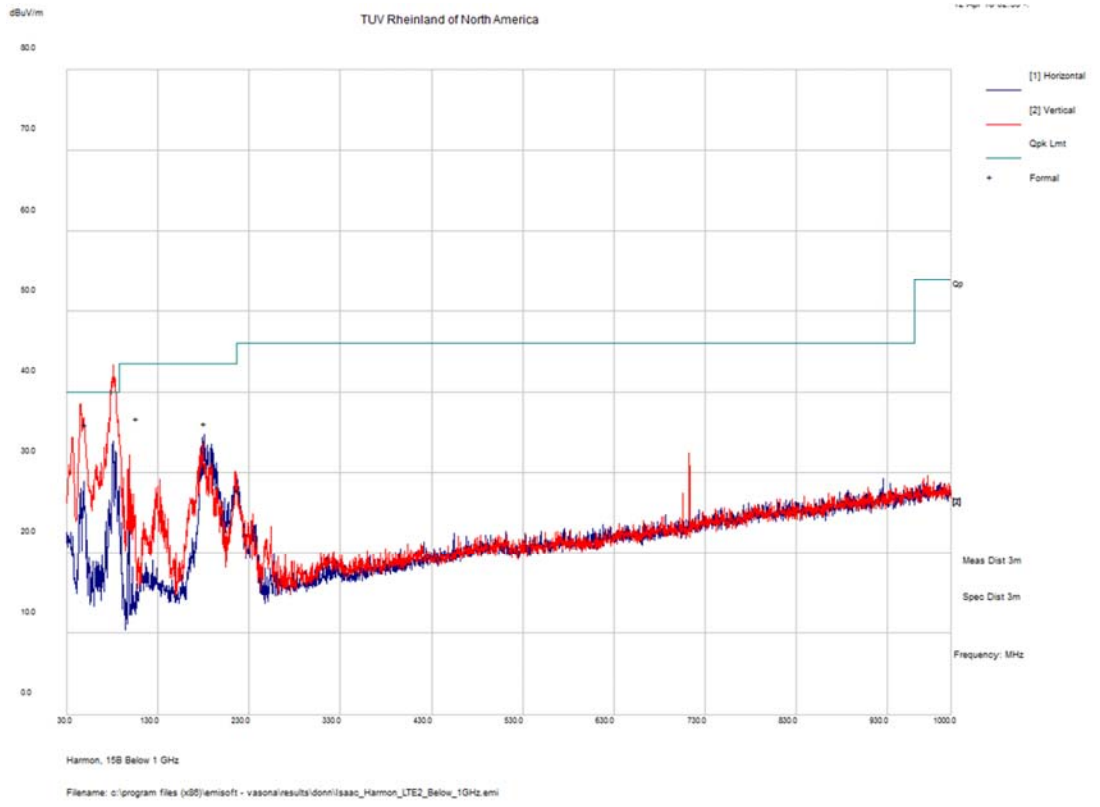


Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1860 MHz/RB#1/RBPos 99/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Bi-Log Antenna	**Date**	Isaac Aguilar

30 MHz – 1 GHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB
44.89562	49.3	2.35	-17.3	34.35	Quasi Max	V	102	32	40	-5.65
81.30687	53.15	2.49	-20.68	34.96	Quasi Max	V	138	58	40	-5.04
86.03343	46.51	2.5	-20.95	28.06	Quasi Max	V	130	152	40	-11.94



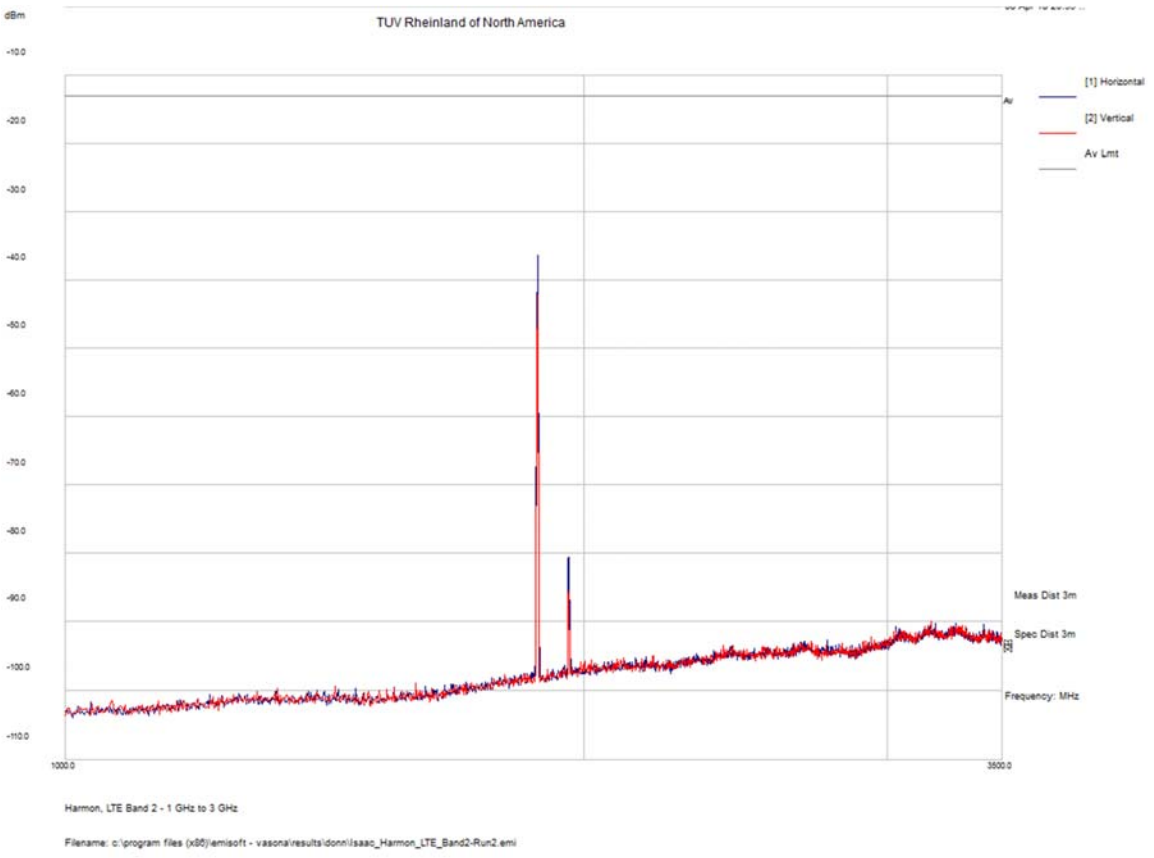
Peak above the limit is the uplink carrier frequency.

Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1860 MHz/RB#1/RBPos 99/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

1 GHz – 3.5 GHz

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB
1880	-14.12	2.2	-24.14	-36.05	Peak [Scan]	H	150	0	-13	-23.05
1862.602	-70.29	2.2	-24.2	-92.29	Peak [Scan]	V	100	360	-13	-79.29
1872.552	-71.17	2.2	-24.17	-93.14	Peak [Scan]	V	100	360	-13	-80.14

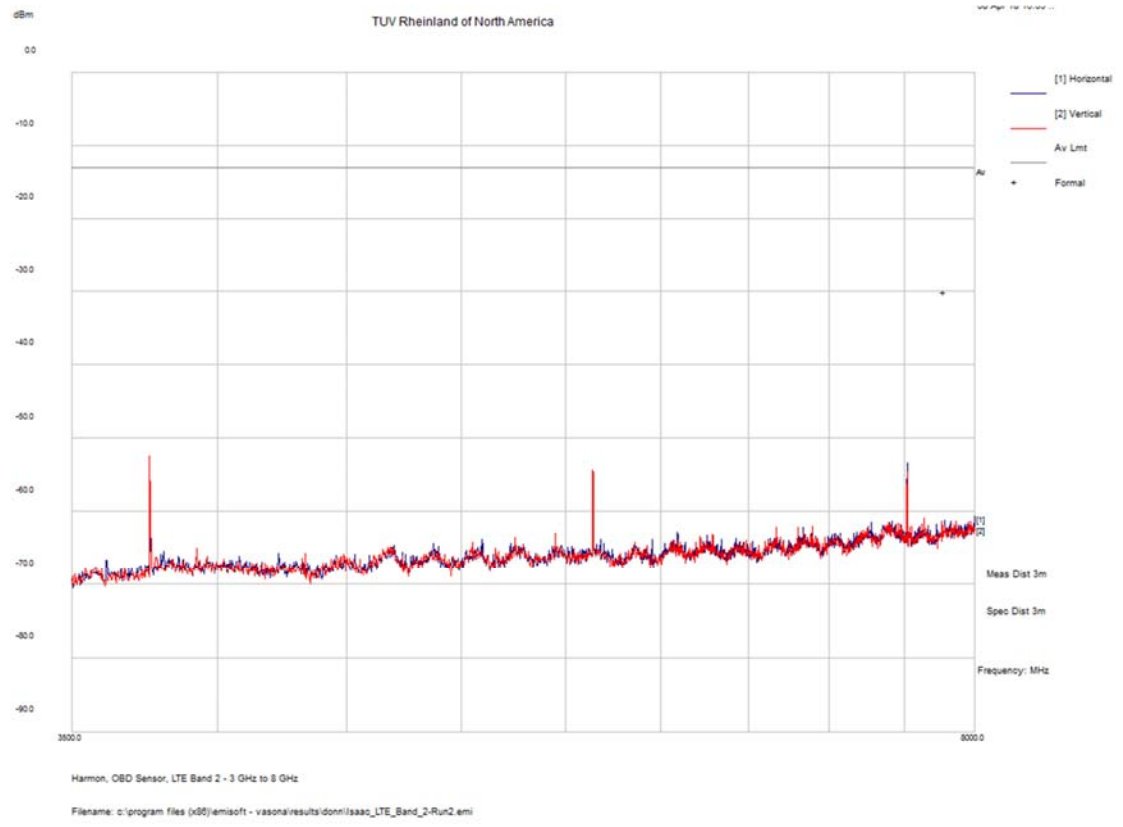


Notes:

Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1860 MHz/RB#1/RBPos 99/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

3.5 GHz – 8 GHz



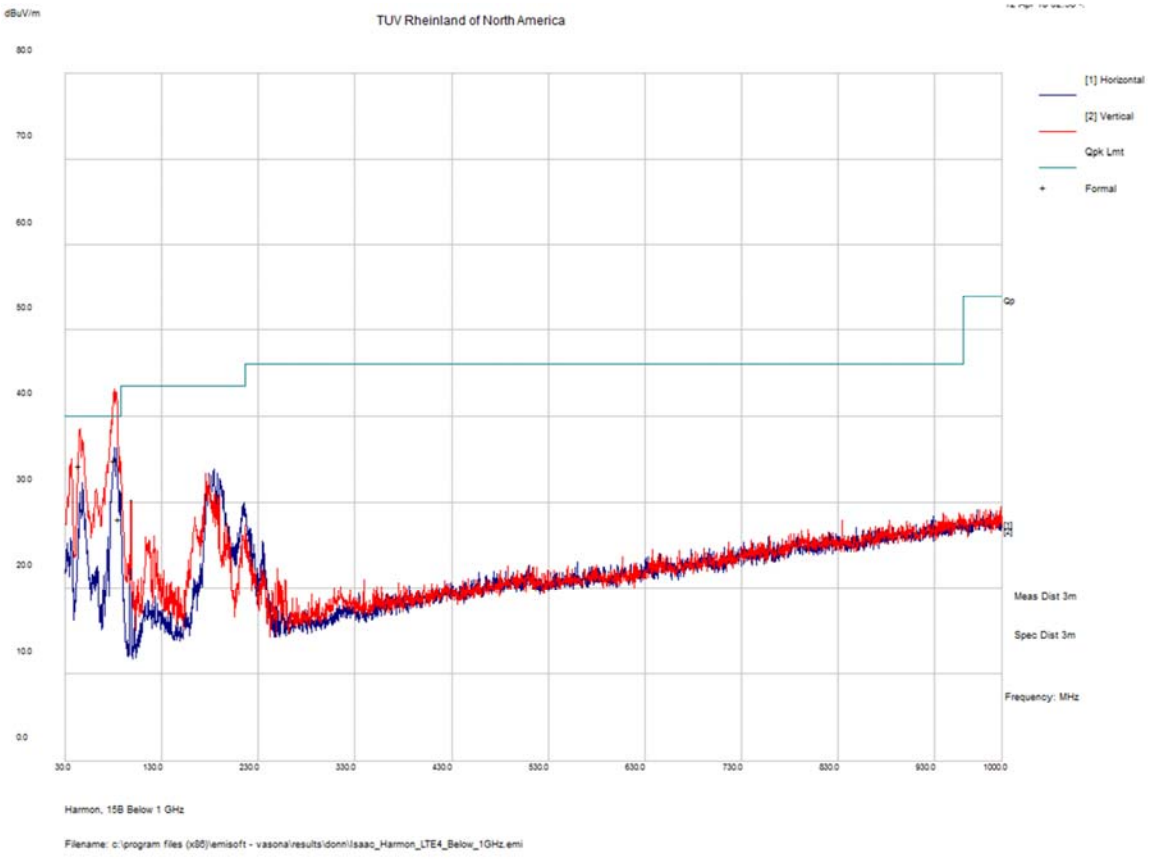
Notes:

Radiated Emissions – LTE Band 4 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1747.5 MHz/RB#1/RBPos 74/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Bi-Log Antenna	**Date**	Isaac Aguilar

30 MHz – 1 GHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB
45.408125	42.84	2.35	-17.62	27.58	Quasi Max	V	112	65	40	-12.42
81.03375	56.74	2.49	-20.65	38.58	Quasi Max	V	213	151	40	-1.42
86.497813	48.59	2.5	-20.95	30.14	Quasi Max	V	186	210	40	-9.86



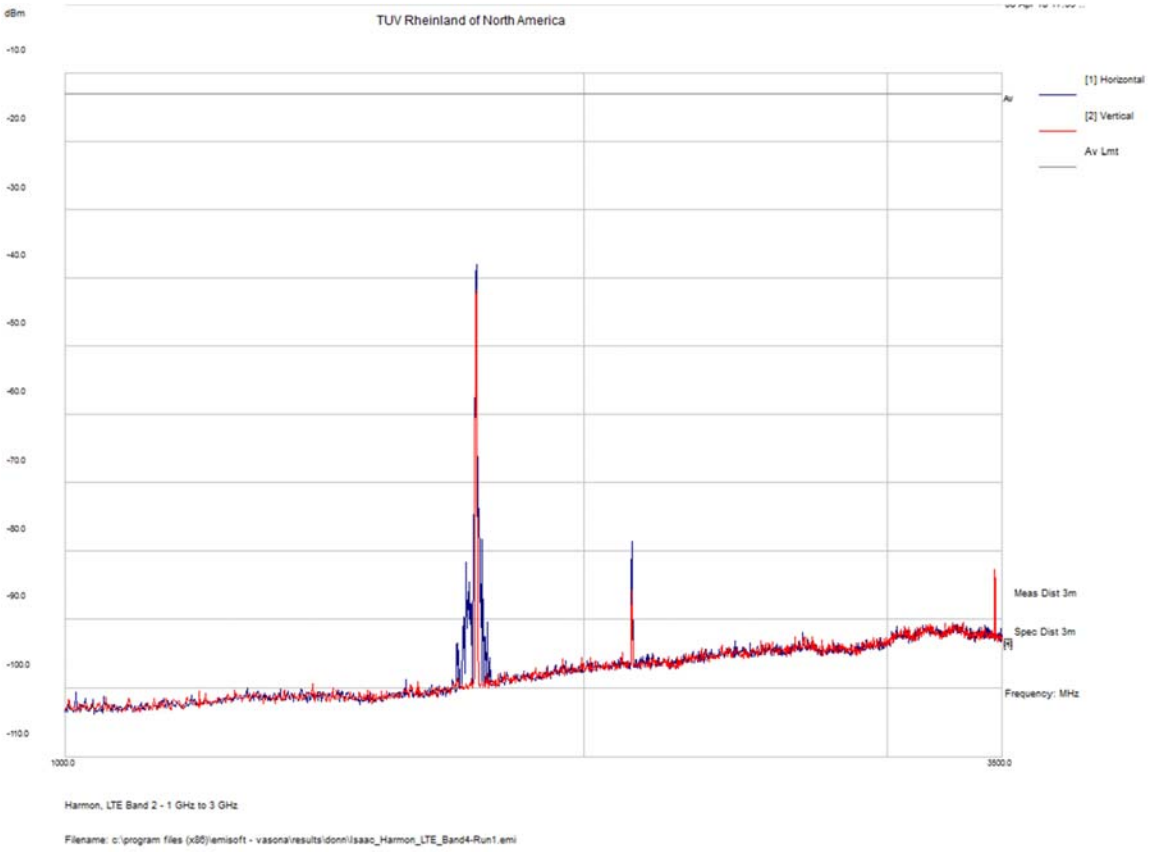
Notes:

Radiated Emissions – LTE Band 4 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1747.5 MHz/RB#1/RBPos 74/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

1 GHz – 3.5 GHz

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB
1732.812	-15.05	2.1	-25.04	-37.99	Peak [Scan]	V	100	0	-13	-24.99
2133.837	-60.39	2.37	-23.74	-81.77	Peak [Scan]	V	100	0	-13	-68.77
1708.398	-60.51	2.1	-25.39	-83.8	Peak [Scan]	V	100	0	-13	-70.8

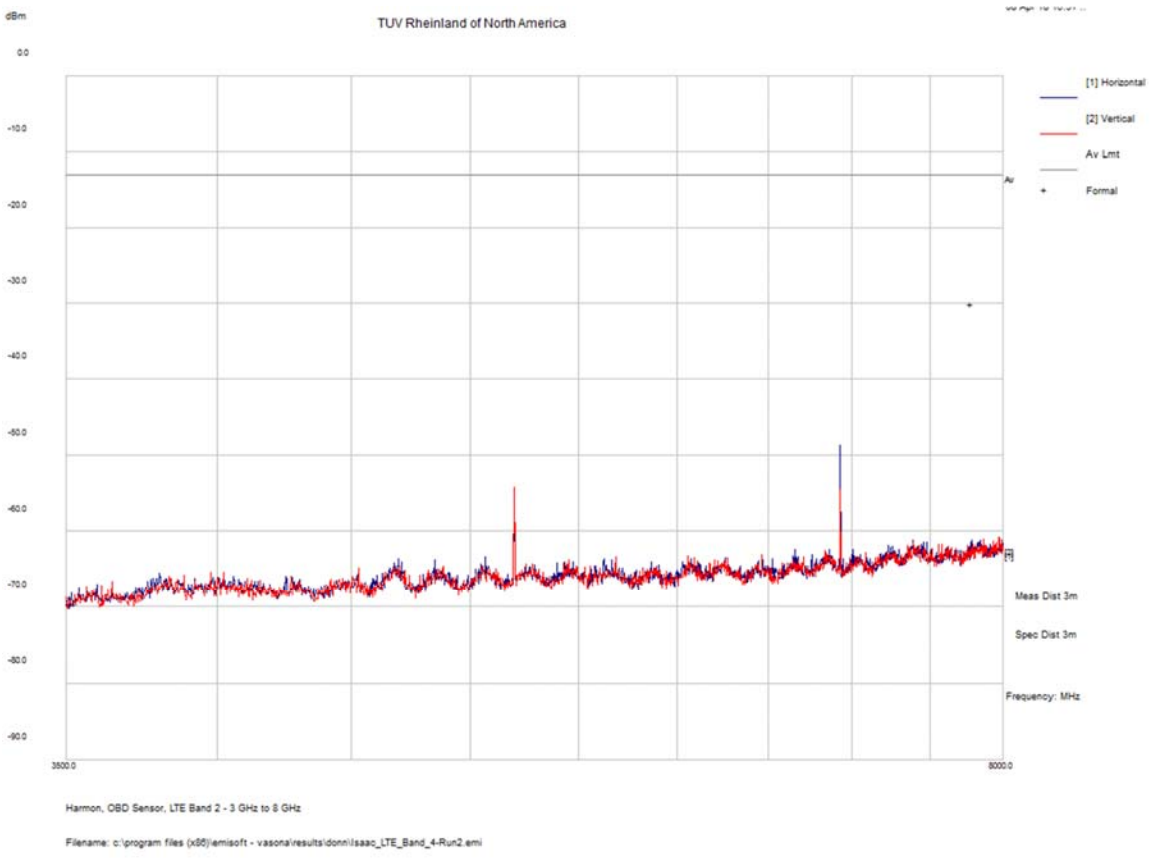


Notes:

Radiated Emissions – LTE Band 4 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	1747.5 MHz/RB#1/RBPos 74/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

3.5 GHz – 8 GHz



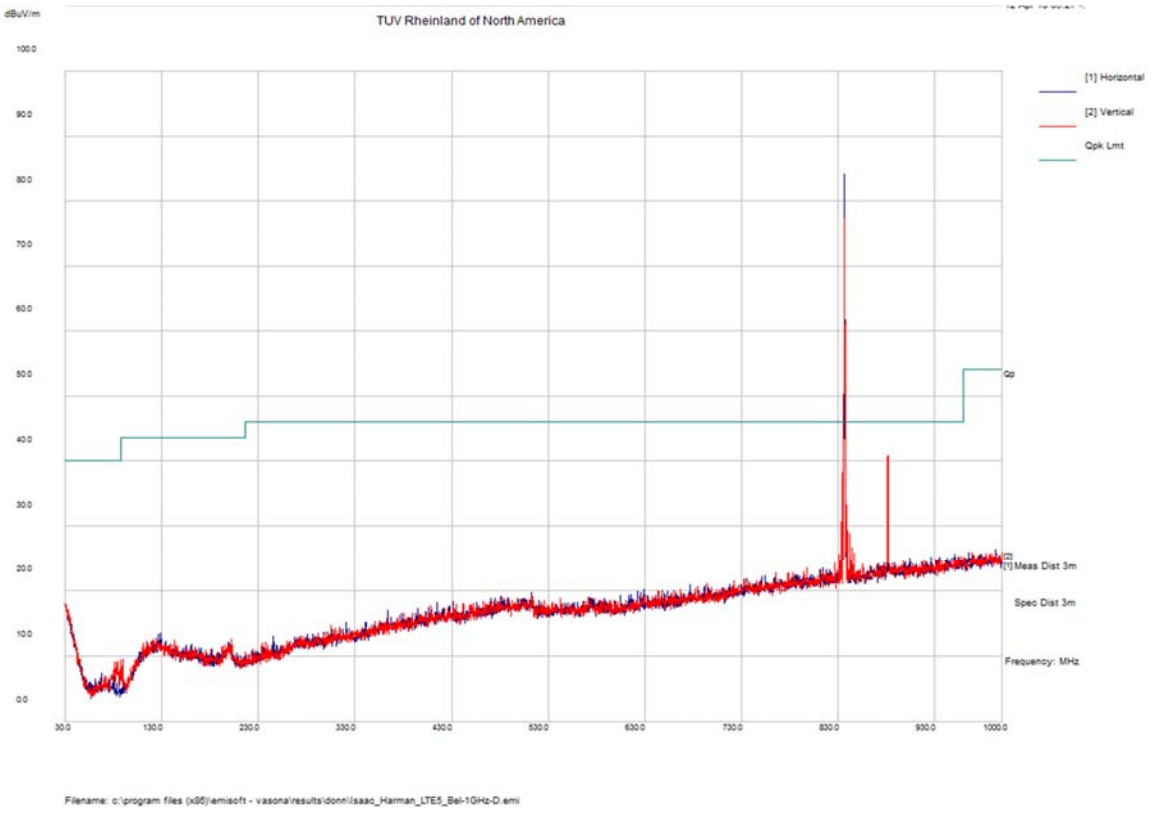
Notes:

Radiated Emissions – LTE Band 5 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	836.5 MHz/RB#1/RBPos 3/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Bi-Log Antenna	**Date**	Isaac Aguilar

30 MHz – 1 GHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB
836.615625	86.07	3.61	-5.51	84.18	Peak [Scan]	H	200	246	46	38.18
881.78125	41.98	3.66	-4.83	40.81	Peak [Scan]	V	200	236	46	-5.19
837.828125	40.29	3.62	-5.53	38.38	Peak [Scan]	V	200	171	46	-7.62
834.796875	40.19	3.61	-5.48	38.32	Peak [Scan]	V	200	177	46	-7.68



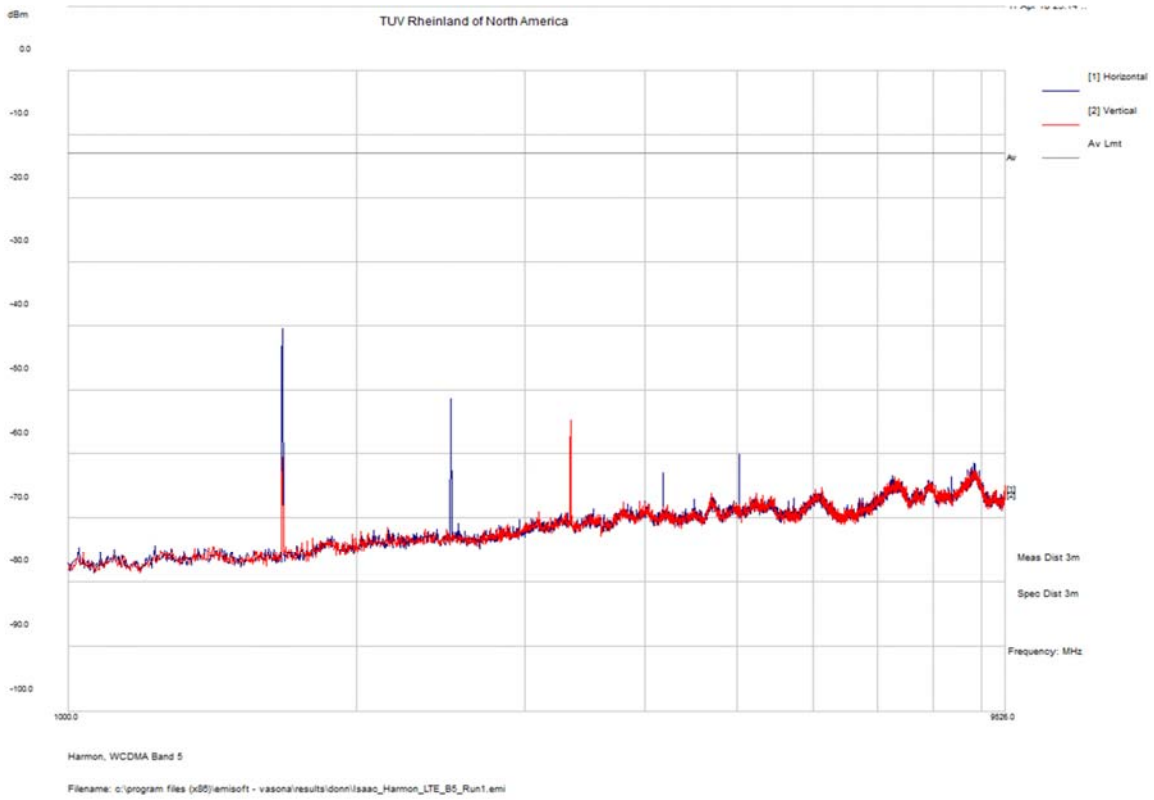
Notes:

Radiated Emissions – LTE Band 5 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	836.5 MHz/RB#1/RBPos 3/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

1 GHz – 10 GHz

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB
1674.0868	-16.85	2.1	-25.78	-40.53	Peak [Scan]	H	200	316	-13	-27.53
1673.713	-17.58	2.1	-25.79	-41.27	Peak [Scan]	V	100	0	-13	-28.27
2510.539	-31.2	2.6	-22.97	-51.57	Peak [Scan]	V	100	0	-13	-38.57
3346.842	-39.44	2.9	-20.5	-57.04	Peak [Scan]	V	100	0	-13	-44.04



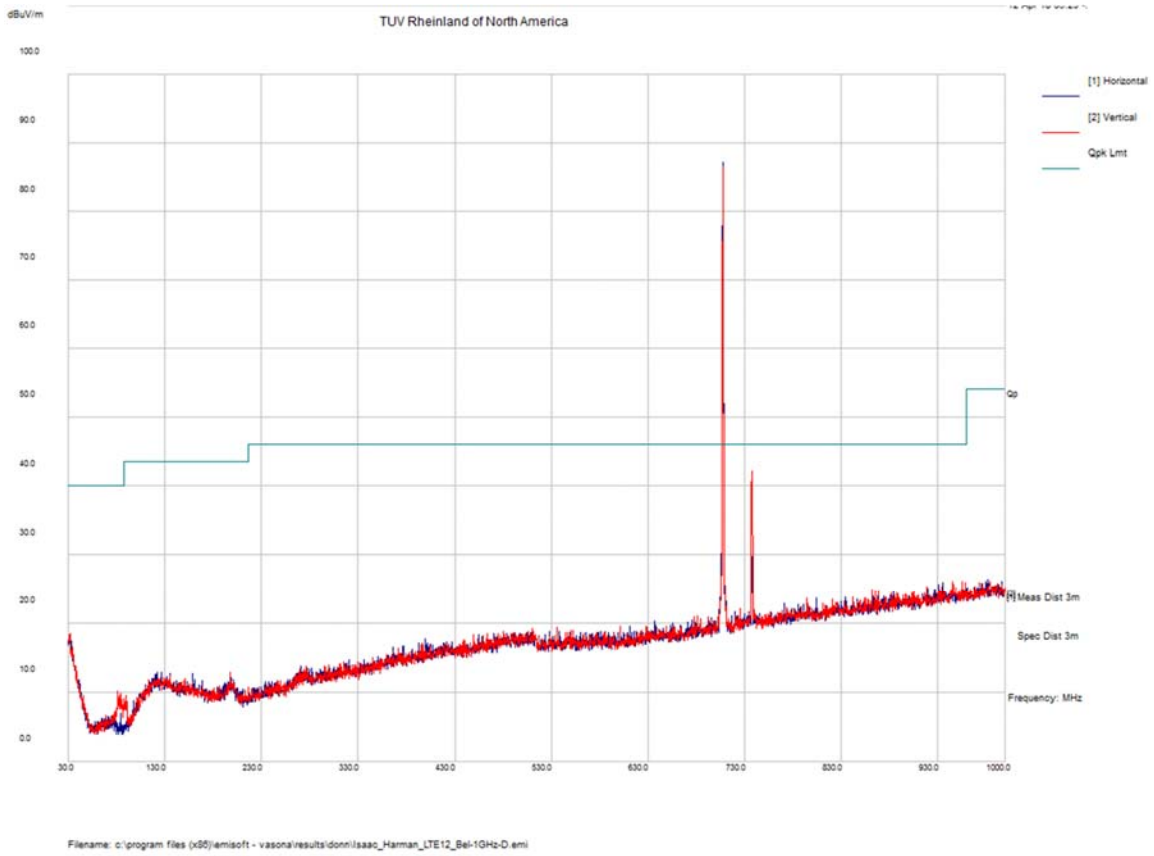
Notes:

Radiated Emissions – LTE Band 12 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	707.5 MHz/RB#1/RBPos 0/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Bi-Log Antenna	**Date**	Isaac Aguilar

30 GHz – 1 GHz for Channel 20050

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB
707.7875	91.18	3.48	-7.43	87.22	Peak [Scan]	H	100	123	46	41.22
737.19063	45.4	3.51	-6.65	42.25	Peak [Scan]	V	100	239	46	-3.75
709.30313	30.34	3.48	-7.37	26.45	Peak [Scan]	V	150	177	46	-19.55



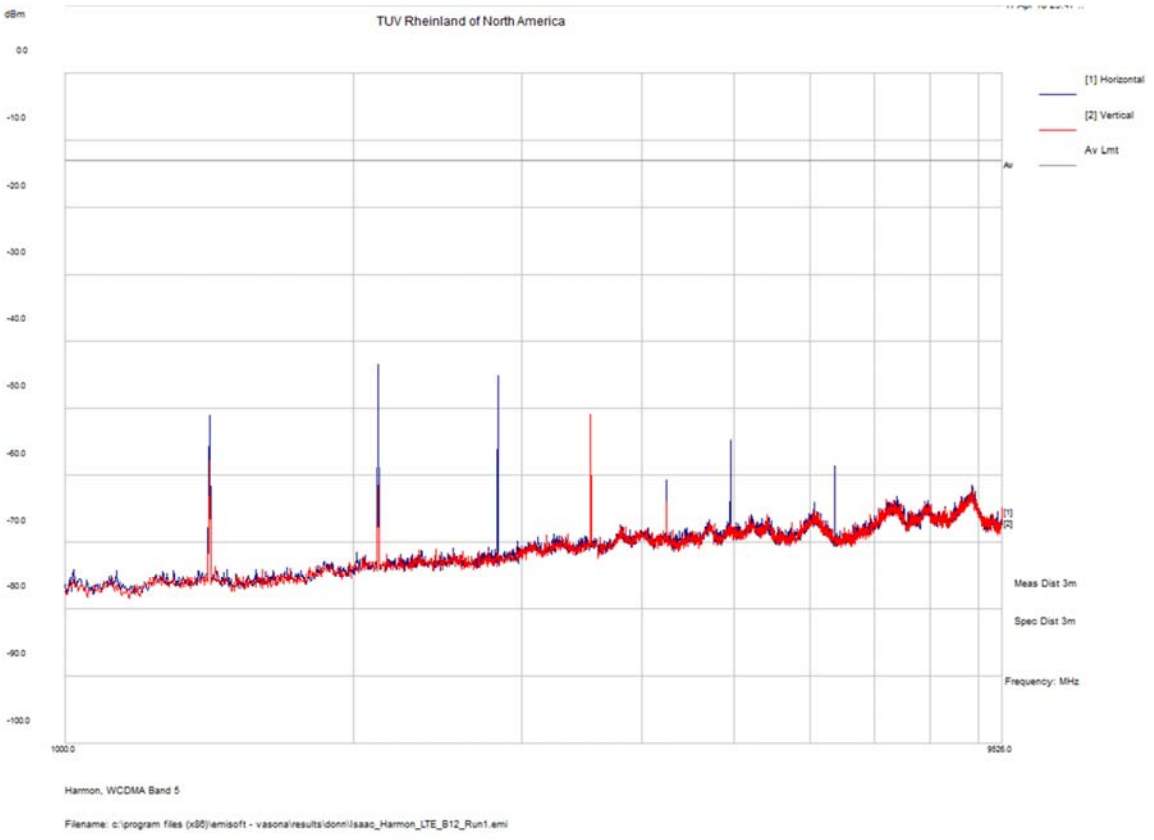
Notes:

Radiated Emissions – LTE Band 12 Worst Case Plots

EUT Name	HSA-15	**Date**	04/12/2018
EUT Model	HSA-15	**Temp / Hum in**	23°/46
EUT Serial	bd41b8ac	**Temp / Hum out**	N/A
EUT Config.	707.5 MHz/RB#1/RBPos 0/Side 1	**Line AC / Freq**	N/A
Standard	ANSI C63.26-2015		
Dist/Ant Used	3 Meter/Horn Antenna	**Date**	Isaac Aguilar

1 GHz – 10 GHz

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB
2123.811	-22.12	2.35	-23.75	-43.52	Peak [Scan]	V	100	370	-13	-30.52
2830.453	-25.69	2.7	-22.38	-45.37	Peak [Scan]	V	100	370	-13	-32.37
1415.643	-27.04	1.9	-26	-51.14	Peak [Scan]	V	100	370	-13	-38.14
3539.129	-35.44	3	-20.31	-52.75	Peak [Scan]	V	100	370	-13	-39.75



Notes:

1279 Quarry Lane, Ste. A, Pleasanton, CA 95466
Tel: (925) 249-9123, Fax: (925) 249-9124

5 Test Equipment List

5.1 Equipment List

Table 6: Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Spectrum Analyzer	Rhode & Schwarz	FSU26	200050	10/24/2017	10/24/2018
Spectrum Analyzer	Rhode & Schwarz	FSU8	101358	11/10/2017	11/10/2018
Base Station	Rhode & Schwarz	CMW500	163510	10/24/2017	10/24/2018
Base Station	Rhode & Schwarz	CMW500	103915	12/20/2017	12/20/2018
Receiver	Agilent	N9038A	MY52260210	01/22/2018	01/22/2019
Receiver	Agilent	N9038A	MY51210195	01/24/2018	01/24/2019
Horn Antenna	Sunol Sciences	DRH-118	A040806	11/11/2017	11/11/2018
Bi-log Antenna	Sunol Sciences	JB3	A061907	11/20/2017	11/20/2018
Directional Coupler	Agilent	87301D Opt 240	14044A	N/A	N/A
Amplifier	MiTeq	TTA1800-30-HG	1842452	01/13/2018	01/13/2019
Amplifier	Hewlett-Packard	8447D	2944A06715	01/26/2018	01/26/2019